Solutions to Problems

CHAPTER 1

1. Answers will vary, but should include the notion that each activity provides benefits in the form of satisfaction or additional income, but also takes time away from the pursuit of other activities (opportunity cost). Time spent on each activity is limited because the additional benefit of devoting an extra unit of time to any one activity falls as more time is devoted to the activity. Hence, as more and more time is spent on one activity, it will become increasingly attractive to devote the next unit of time to some other activity.

2. Answers will vary.

3. (a) normative
   (b) positive
   (c) positive
   (d) normative

4. Average cost is $1.17(19.95 \div 17)$. Marginal cost is $0.

5. (a) The state should allow the market to provide what people want. Since gambling is not mandatory, only those who want to gamble will do so. Tax revenues that arise from casino gambling are paid voluntarily.
   (b) Some argue that casino gambling is associated with criminal activity that has a cost to the community at large. In addition, gambling can be addictive, and sometimes entices those who can least afford it to participate. These concerns bear on the efficiency argument to the extent that there are costs from gambling not reflected in the price of gambling. These costs could potentially affect the community at large (e.g., more crime, the social cost of addiction) or the individual (to the extent that gambling creates unwanted addiction). The concern about the income bias of gambling (and the associated income bias of the tax revenue generated form gambling) is, in and of itself, an equity concern, not an efficiency one, although there could be social costs that arise from it.

6. (a) Tuition (which could have been spent on other things), forgone wages, study time, etc.
   (b) All the money (gas, depreciation of the car, etc.) could have been spent on other items; time spent en route could have been used for other activities.
   (c) A better grade, no headache, perhaps admission to a better grad school, a higher-paying job. He has traded off an investment in human capital (staying in to study) for present consumption (going to the party).
   (d) The other things that $200 could buy.
   (e) The $1 million could have been invested in other profit-making ventures or projects or it simply could have been put into the bank or loaned out to someone else at interest.

    (f)   From the standpoint of the store, Alex is free. From Alex's standpoint he gives up other uses of time and wages that could be earned elsewhere.

7. Answers will vary.

CHAPTER 1 APPENDIX

1. The slopes are as follows: line 1: 5; line 2: –5; line 3: 1; line 4: –1; line 5: slope is 1 as X goes from 0 to 20, and –1 as X goes from 20 to 40; line 6: –250.

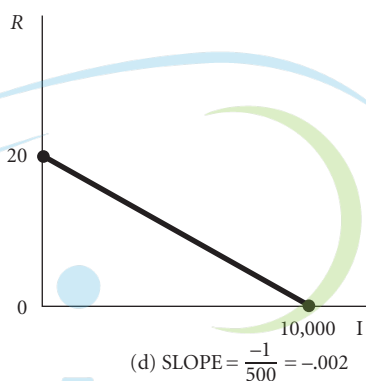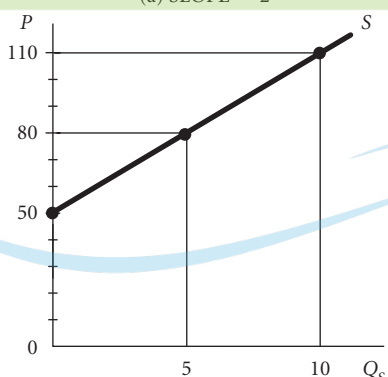SLOPE 5

SLOPE –5

SLOPE 1

SLOPE –1

SLOPE (0–20) = 1
SLOPE (20–40) = –1
slope is 1 as x goes from 0 to 20,
and –1 as x goes from 20 to 40.
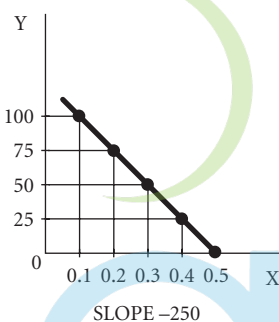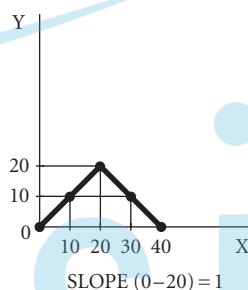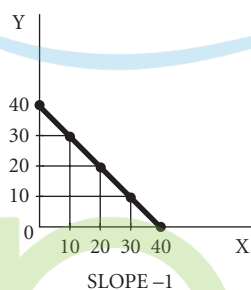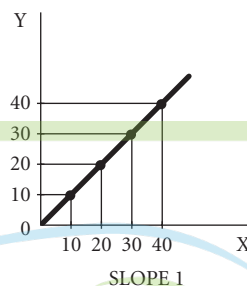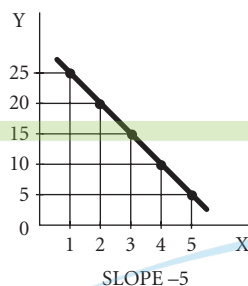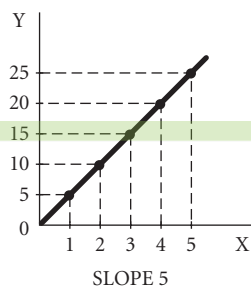
SLOPE –250

2. Answers will vary.
    (a)   Negative slope. As price rises, quantity of apples purchased falls.
    (b)   Positive (and declining) slope. As income rises, taxes rise, but the rise in taxes is less at higher incomes than at lower incomes.
    (c)   Negative (and declining) slope. As mortgage rates fall, home sales increase, but the increase in home sales is more at lower mortgage rates than at higher mortgage rates.
    (d)   Negative, then positive slope. As young children get older, they run faster, but as adults get older (beyond a certain age), they run slower.
    (e)   Positive slope. Greater sunshine leads to greater corn yield.
    (f)   Positive, then negative slope. Up to a point, more fertilizer increases corn yield, but beyond a certain point, adding more fertilizer actually decreases the yield.

3.

P

10

0

5   Q_D

P

(a) SLOPE = −2

P

100

0

25   Q_D

P

(b) SLOPE = −4

P S

110

80

50

0

5   10 Q_S

(c) SLOPE = +6

R

20

0

10,000 I

(d) SLOPE = $\frac{-1}{500}$ = −.002
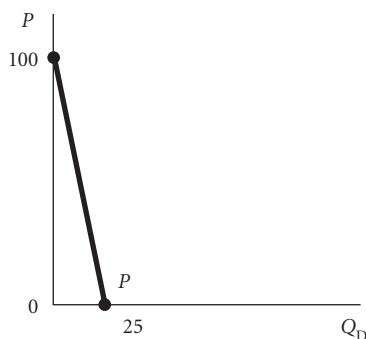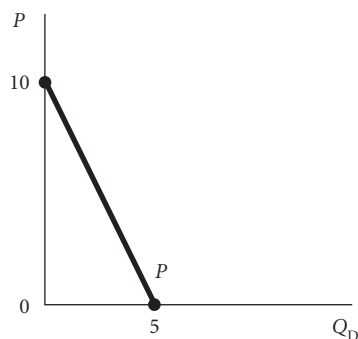
CHAPTER 2

1. Answers will vary, but should include:
    (a) the value of alternative uses of time (studying for other classes, leisure).
    (b) the value of alternative uses of time (studying, other forms of leisure).
    (c) the value of the other goods and services that could have been purchased with the money used to purchase the car.
    (d) the value of the goods and services that taxpayers could have purchased with the additional property tax revenue.
    (e) the value of other goods and services that the governments could have purchased with the money used to purchase the space station, or the value of the goods and services that taxpayers could have purchased with the tax revenue used to finance the space station.
    (f) the foregone salary that you would have earned and the value of the alternative uses of time.

2. Disagree. To be efficient, an economy must produce what people want. This means that in addition to operating on the *ppf* (resources are fully employed, best technology is being used) the economy must be operating at the *right* point on the *ppf*.

3. Opportunity costs of building the bridge include the value of other goods and services that the government of Mallsburg could have purchased with $25 million or the value of the goods and services that taxpayers could have purchased with the tax revenue used to finance the bridge, as well as any inefficiencies created by the income tax by reducing incentives to work. In addition, the construction itself may impose costs – delays, noise, and so on – and presumably shopkeepers located near the older bridge will lose as consumers shift their business toward the main mall.

   Benefits of the new bridge include reduced travel time for shoppers and commuting time for workers, increased sales tax revenues for Mallsburg, and gains for shopkeepers located in the main mall.

    There may be other quality of life costs and benefits that are difficult to sort out without more information. The bridge may have environmental effects that could be positive (less pollution from idling traffic) or negative

(depending on where and how the bridge is constructed). Also, there may be effects on the look and lifestyle of the town. A bridge through the center of the town is likely to effect daily living in any number of ways.

Beyond the costs and benefits, there is always the question of distribution. Is the income tax system of Mallsburg equitable? Are the shopkeepers likely to lose poorer than those likely to gain? Economists would typically argue for governments to undertake projects whose costs exceed their benefits, and then address any concerns about income distribution separately. To the extent these concerns are not addressed, however, you might consider writing about the income distribution effects of the new bridge.

4. (a) For Kristen, the "cost" of a potholder is five wristbands; for Anna, the cost of a potholder is six wristbands. Kristen has a comparative advantage in potholders.

(b) Anna has a comparative advantage in the production of wristbands because the opportunity cost (1/6 potholder) is lower for Anna than it is for Kristen (1/5 potholder).

(c)
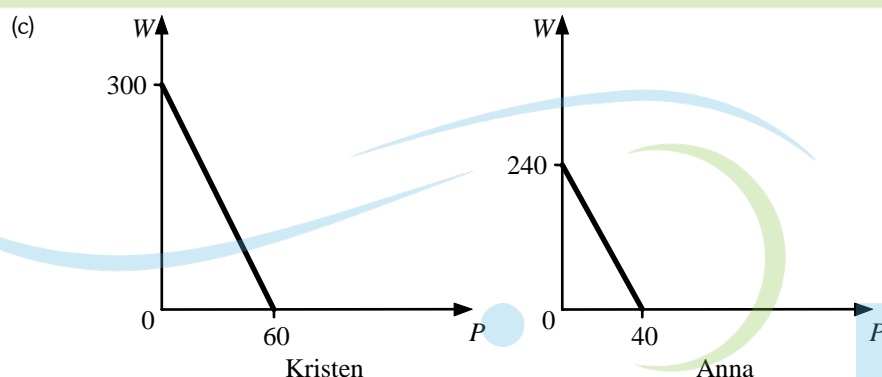
Kristen

Anna

(d) Kristen: 150 wristbands and 30 potholders. Anna: 120 wristbands and 20 potholders. Total wristbands = 270. Total potholders = 50.

(e) 285 wristbands and 51 potholders.

(f) Kristen should completely specialize in potholder production and earn 60 x $5.50 = $330. Anna should completely specialize in wristband production and earn 240 x $1 = $240. Maximum combined revenue is $570.

5. (a) Sherice sacrifices the value of goods and services that could have been purchased with the income from work in order to obtain more leisure today. To the extent that this income will need to be replaced to finance her education, Sherice CHap substitutes future work for present consumption (of leisure). On the other hand, if the time off improves Sherice's state of mind, she may be a more successful student, which may be pleasant in its own right, and may also provide monetary rewards (better job, better graduate school) in the future.

(b) The opportunity costs are the alternative uses of time spent working out and the foregone pleasure of consuming foods that are not part of the diet. Presumably, the present sacrifice yields a future benefit of better health and more enjoyment of leisure activities.

(c) Time and money spent today on maintenance is an investment. By reducing resources available for consumption today, more resources will be available in the future (since repair costs will be lower and breakdowns less frequent).

(d) Jim may get to work faster, but at the risk of an accident or ticket, which could be costly. Included in the potential cost of this behavior are the monetary, criminal, or psychological penalties (remorse or direct concern about the welfare of others) that Jim will pay if others are harmed.

6. (a) Blah.
Blah.

(b) Blah: fruit.
Figistan: timber.

(c)
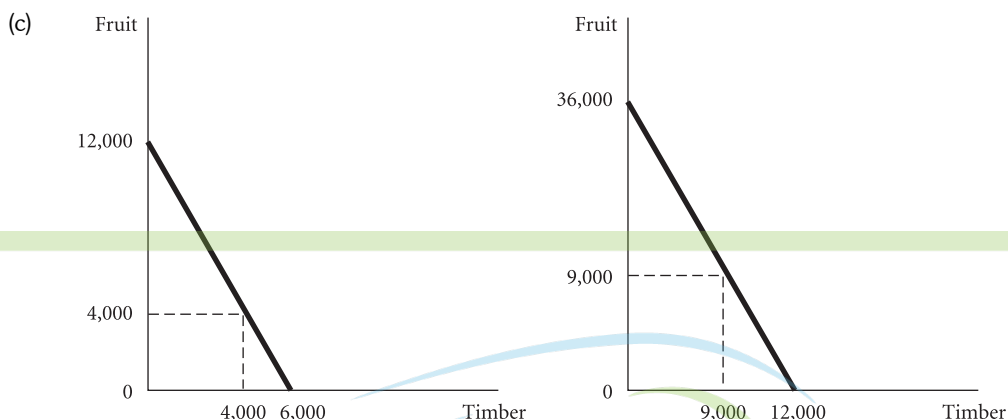
(d) Figistan: 800 workers to timber
400 workers to fruit
produces 4,000 of each
Blah: 900 workers to timber
300 workers to fruit
produces 9,000 of each

(e) Figistan moves all labor to timber and produces 6,000 board feet.
Blah moves to 150 out of timber into fruit.
450 in fruit produces 13,500 baskets; 750 in timber produces 7,500 ft.
Blah trades 4,200 baskets to Figistan for 1,800 board ft.
Blah ends up with 9,300 of each; Figistan ends up with 4,200 of each.
Both move beyond their individual *ppfs*.

7. (a) The ppf curve is a straight line intersecting the Y-axis at 1,000 units of luxury goods and intersecting the X-axis at 500 units of the necessity goods. These are the limits of production if all resources are used to produce only one good.

(b) Society's production could be inside the ppf as a result of (i) unemployment or underemployment of labor or (ii) inefficient production with full employment. With only one factor, the possibility of inefficient production means that workers are not using the best available technology to produce one or both goods. To move from inside to the ppf to a point on the ppf, the economy would need to move to full employment or to adopt the most efficient production technology.
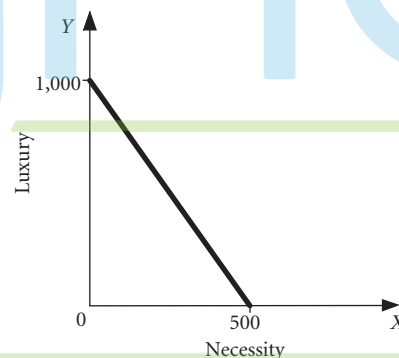

(c) Answers will vary, but the decision should be based on the relative value of necessities and luxuries, as well as the degree of concern that enough necessities are produced to meet the needs of the population. Although this part does not address distribution, if too few necessities are produced, some people will not have enough necessities under any distribution scheme.

(d) If left to the free market, income distribution will depend on some combination of individual effort and chance, where chance includes the possession of valuable abilities, opportunity, and inheritance. Each individual would have to find a job to earn income to command some of the economy's production.

8. (a) c, d, e.
(b) a, b, d, e, f.
(c) d, e (since they prefer meat).
(d) e.
(e) b, c, d, e, f.
(f) b.

9. (a)
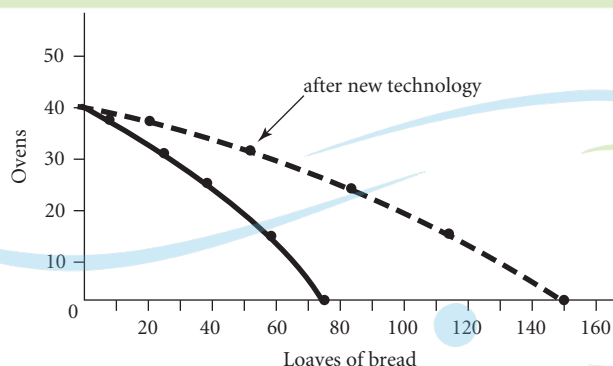
(b) Yes, increasing opportunity cost applies. The opportunity cost of the first 15 million loaves of bread is 4 ovens; of the next 15 million loaves, 6 ovens; and so on.

(c) Over time, as the number of ovens increases, the capacity to produce bread with the same quantity of other resources will also increase. Thus, the production possibilities curve will shift out horizontally to the right. The vertical intercept (maximum possible oven production) will remain unchanged, but the horizontal intercept (maximum possible bread production) will increase.

(d) See graph in part (a) above.

(e) Before the introduction of the new technology, production of 22 ovens left enough resources to produce 45 loaves of bread. After the introduction of the new technology, production of 30 ovens leaves enough resources to produce 60 loaves of bread.

10. Answers will vary.

CHAPTER 3

1. (a)

P

S_{1999}

S_{2003}

P_{1999}

P_{2003}

D_{2003}

D_{1999}

0   Q_{1999} Q_{2003} Q

LAP TOPS

(b)

P

S_{2003} S_{2004}

P_{2004}

P_{2003}

D_{2003} D_{2004}

1.4   1.8

MILLION
OF BARRALS OR
CRANBERRIES

(c)

Rent

S

R_{1999}

R_{2005}

R_{2001}

D_{1999}
D_{2005}
D_{2001}

0

Vacancy at
1999 Rent

Office
Space

(d)

P

P_2 S

P_1

D

0   Q_s Q Q_d Q

Bread

P_1 = Regulated Price
P_2 = Unregulated price

(e)

P

S_{dom}

$35

$22   World Price

D_{dom}

Q_1 imports Q_2 Q

Tons of steel

2. (a)

P S

$35

D

0   57,478   ? Q

New York Game

P S

$35

D

0   8,545   43,772 Q

Tampa Game

(b) It depends on whether demand responds to the lower price and by how much. The diagram in (a) suggests that if price was lowered by a lot, the stadium would be filled. If demand is "elastic" enough, the quantity demanded will increase by more than the fall in ticket price, and revenues will rise. If demand is not responsive enough, the quantity demanded may not increase enough to offset the fall in ticket prices, and revenues will fall. The easiest example of the latter would occur if demand were "perfectly inelastic," which implies that no one else would come to the game despite the lower price.

(c) The price system was not allowed to work to ration the New York tickets. Some other rationing device must have been used. Perhaps people stood in line or queued. Perhaps there was a lottery. In all likelihood, there would be a secondary market for the tickets ("scalpers"). You could no doubt find them for sale on line at a high price.

3.   If the supply of new homes kept pace with the expanding demand, prices would remain constant. The supply curve shifts to the right at the same rate as the demand curve shifts to the right:

4.   (a) Disagree. They are complements.
      (b) Agree.
      (c) Disagree. A rise in income will cause the demand for inferior goods to fall, pushing prices down.
      (d) Disagree. Sure they can. Steak and lobster are both normal goods.
      (e) Disagree. Price could go down if the shift of supply is larger than the shift of demand.
      (f) Agree.

5.   If the price of tobacco is supported by limiting land used to grow it, then the supply curve for tobacco shifts to the left. The anti-smoking publicity works to shift the demand curve to the left. Both of these policies work together to reduce consumption of tobacco.
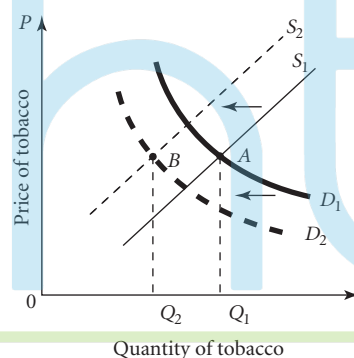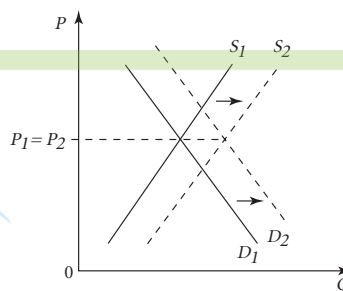
6.   (a) A simple demand shift; same diagram for both cities.

      (b) Rightward shift of supply with new development; leftward shift of demand with falling incomes; same diagram for both cities. (Assumes the shifts are equal.)
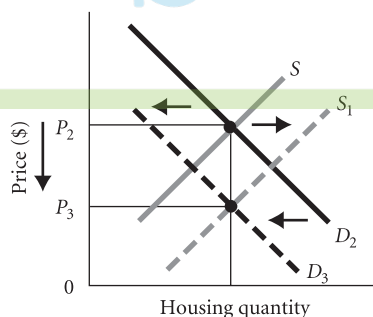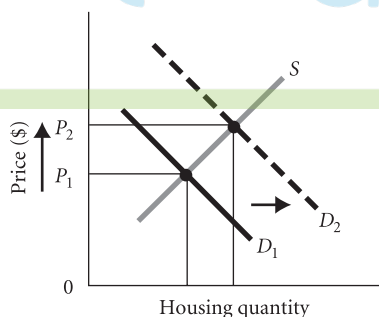
(c) Trade-up buyers shift demand in the higher-income towns and supply in the lower-income towns.

Housing quantity,
higher-income towns
(Boston area)

Housing quantity,
lower-income towns
(Boston area)
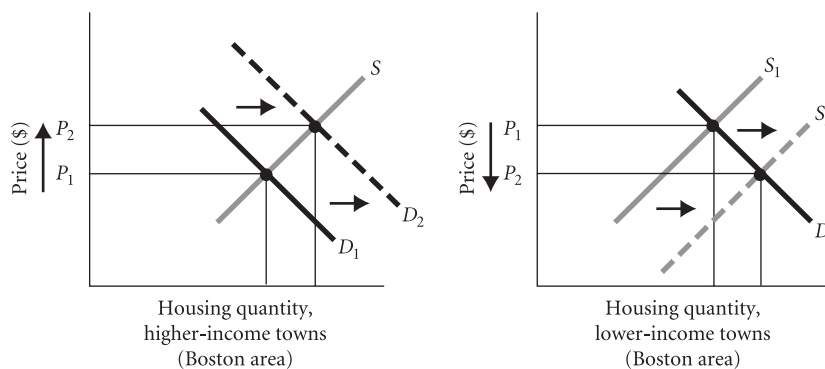
7. (a) This sequence confuses changes in demand (shifts of the demand curve) with changes in quantity demanded (movements along a demand curve). First, a demand shift does cause price to rise. As price rises, the quantity supplied increases along the supply curve, and the quantity demanded declines along the new demand curve as the market moves to reestablish equilibrium. Nothing here suggests that demand shifts back down, or that prices will fall back to their original levels.

(b) This sequence confuses a change in price (per unit) with a change in total spending on meat. When price falls, the quantity demanded increases along the demand curve. Thus, the total amount spent (price × quantity demanded) depends on whether quantity demanded goes up by more than price per unit falls. Total spending could increase if demand responds strongly to the lower price.

8. (a) P decreases, Q decreases   (b, d) P increases, Q increases
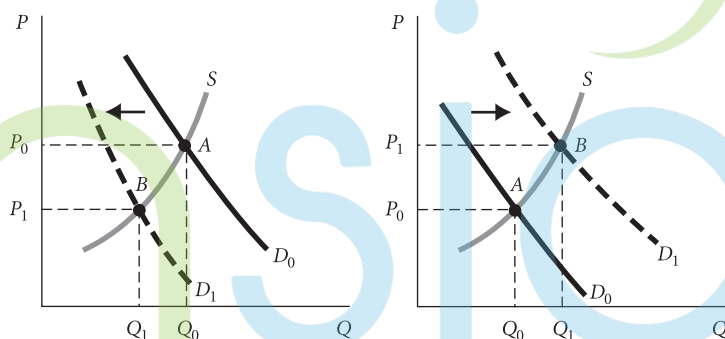
(c) P increases, Q decreases   (e) P decreases, Q increases
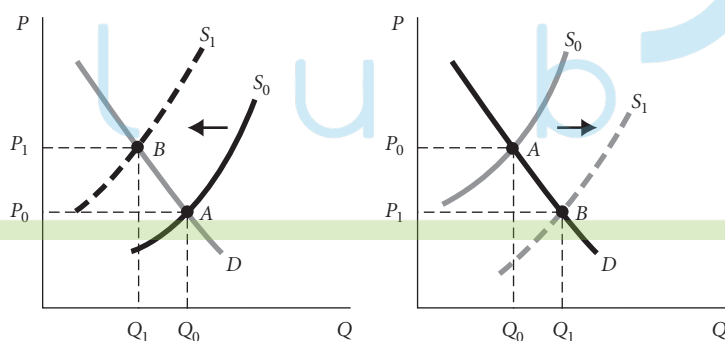
9. (a)

Price	Quantity Demanded (in Millions)	Quantity Supplied (in Millions)
$.50	90	30
$1.00	80	50
$1.50	70	70
$2.00	60	90
$2.50	50	110

(b)   Quantity demanded equals quantity supplied at P = $1.50, with quantity = 70 million dozen eggs.

(c)

10. (a)

Subsidies   Vouchers
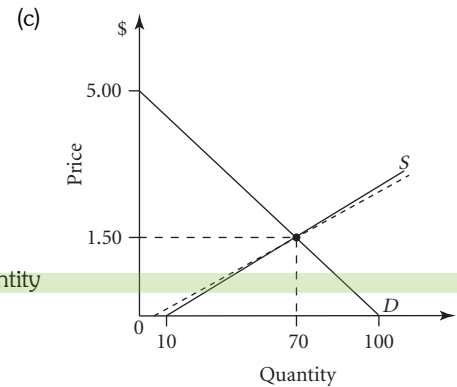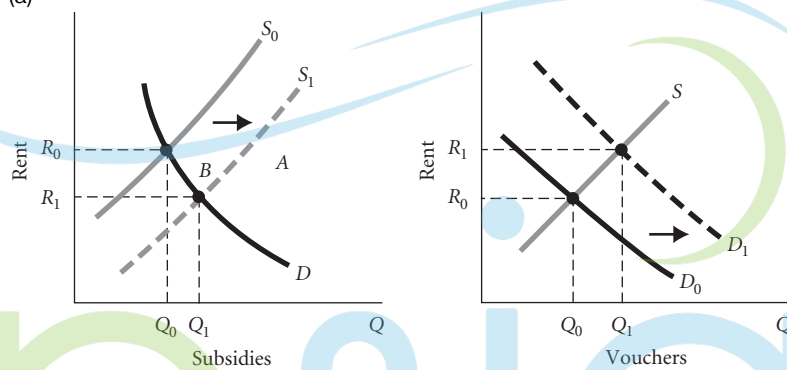
The demand side strategy (vouchers) results in higher rents.

(b)   Critics believe that the supply curve for low-income housing looks like this:
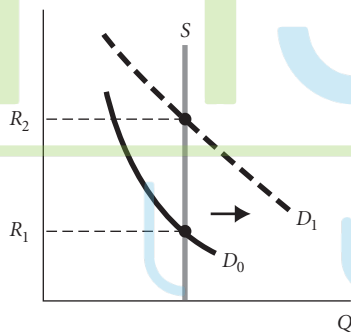
11. (a)
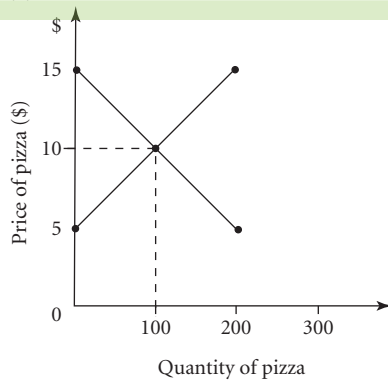
(b) $Q_d = Q_s \rightarrow 300 - 20P = 20P - 100 \rightarrow P = \$10$. Substitute $P = \$10$ into either the demand or supply equation to get $Q = 100$.

(c) With $P = \$15$, producers would want to supply $20 \times 15 - 100 = 200$ pizzas, but consumers would want to buy $300 - 20 \times 15 = 0$ pizzas. There would be an excess supply of pizzas, which would bring the price down. As the price decreased, quantity supplied would decrease while quantity demanded would increase until both were equal at a price of $10 and a quantity of 100.

(d) The new market demand for pizzas would be $Q_d = 600 - 40 P$.

(e) $Q_d = Q_s \rightarrow 600 - 40 P = 20 P - 100 \rightarrow 700/60 = \$11.67$. Substitute $P = \$11.67$ into either the demand or supply equation to get $Q = 133$.

CHAPTER 4

1.

(a)
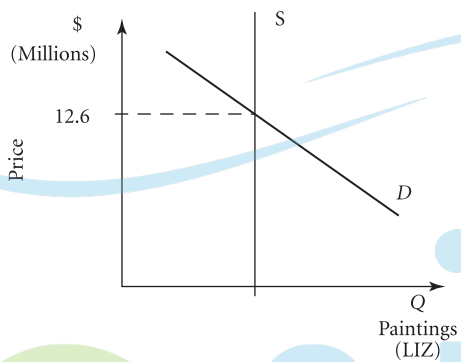
(b)
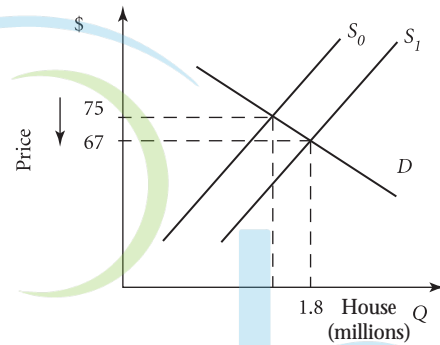
(c)
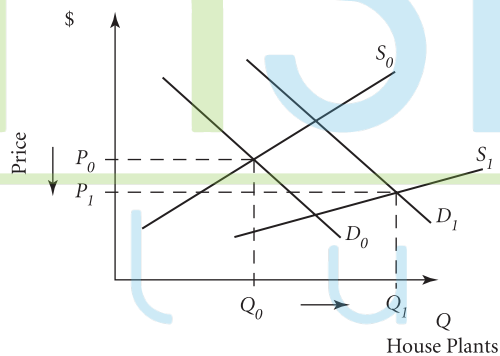
2.   Disagree. Every demand curve hits the quantity axis because of diminishing marginal utility . . . at a price of zero, there is a limit to how much one can or wants to consume. The argument that at some price demand goes to zero explains why all demand curves hit the price axis.

3.
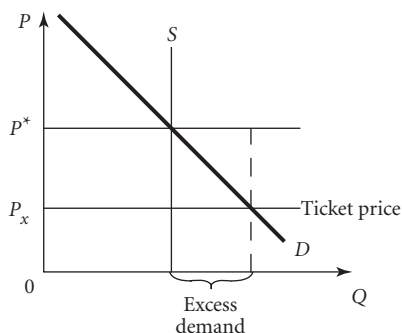
The diagram shows that some people are willing to pay a very high price (even higher than P^*) for the tickets. Some nonprice rationing system was used to allocate the tickets to people willing to pay as little as P_X. What a scalper does is pay those near P_X more than they paid for the tickets and then sells the tickets to someone nearer or even above P^*. Since both the buyers and sellers engage in the trade voluntarily, both are better off and the exchange is efficient.

4.   The subsidy does increase the "cost" of planting—there is now an opportunity cost. (By planting, the farmers will have to give up the subsidy.) The subsidy will clearly lead to fewer acres of production and higher farm prices. In effect, it shifts the supply curve to the left.

5.   Disagree; this is not hard to explain. The law of demand does say that higher prices should lead to lower demand, but that refers to a change in the quantity demanded, a movement along a demand curve. An increase in demand (a rightward shift of the demand curve) would result in a higher price. Therefore, a sharp increase in the demand for apartments in New York City is entirely consistent with a sharp increase in rent, which is the price of those apartments.
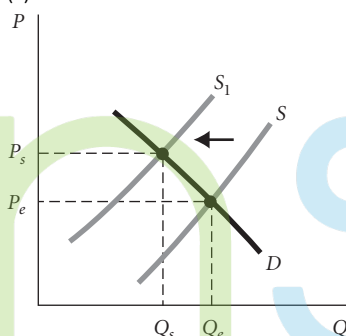
6.   (a) Wheat market   (b) Hamburger market   (c) Gasoline market
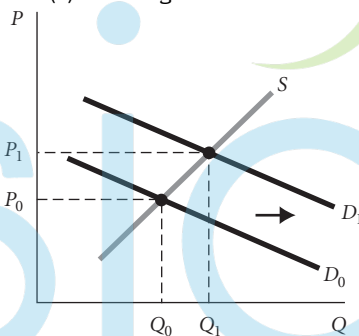
7.   (a)   (b)
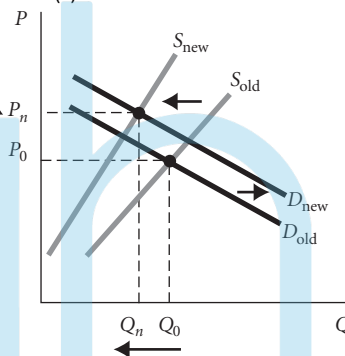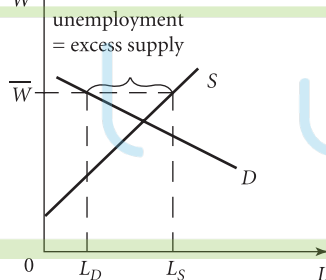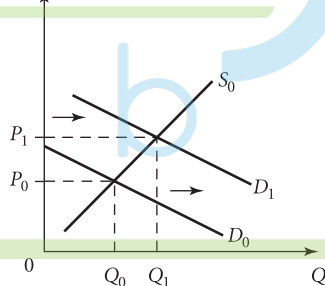
8.   (a)
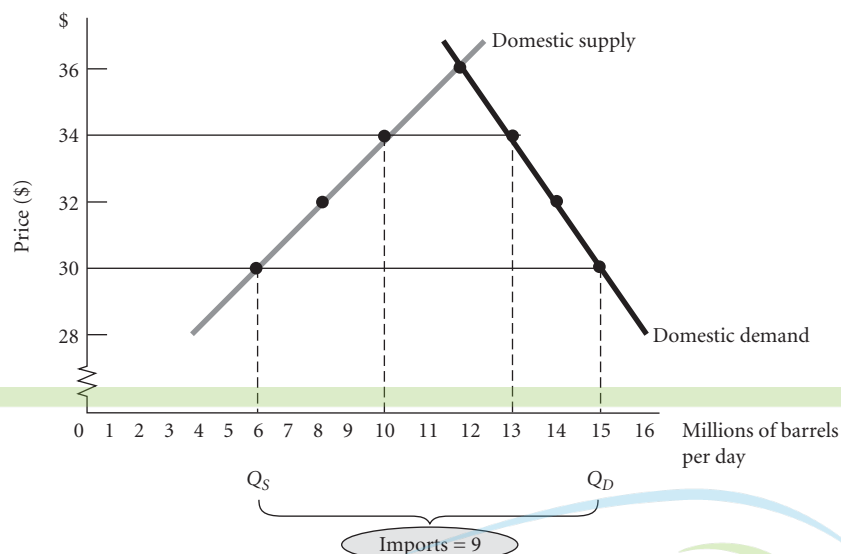
(b) With free trade in oil, Americans would pay $30 per barrel. At this price, the U.S. demand schedule shows that Americans would buy 15 million barrels per day. The U.S. supply schedule shows that U.S. producers would supply 6 million barrels per day, with the remainder—9 million barrels—imported from foreign sources.

(c) With a tax of $4 per barrel, Americans would have to pay $34 for imported oil. Quantity demanded would decrease from 15 million to 13 million barrels. Of this, American producers would supply 10 million barrels, whereas imports would be cut back from 9 million to 3 million barrels. The U.S. government would collect a tax of $4 × 3 million = $12 million per day.

(d) American oil consumers are harmed by the tax; they are paying a higher price for oil. American oil producers are helped by the tax; they receive a higher price for oil, and this induces them to produce more oil. Foreign oil producers are harmed, because Americans buy less imported oil. Finally, the U.S. government (and the U.S. taxpayer generally) benefit from the tax revenue.

9. (a) Using demand and supply data for the United States only, the equilibrium price is $36 and the equilibrium quantity is 12 million barrels.
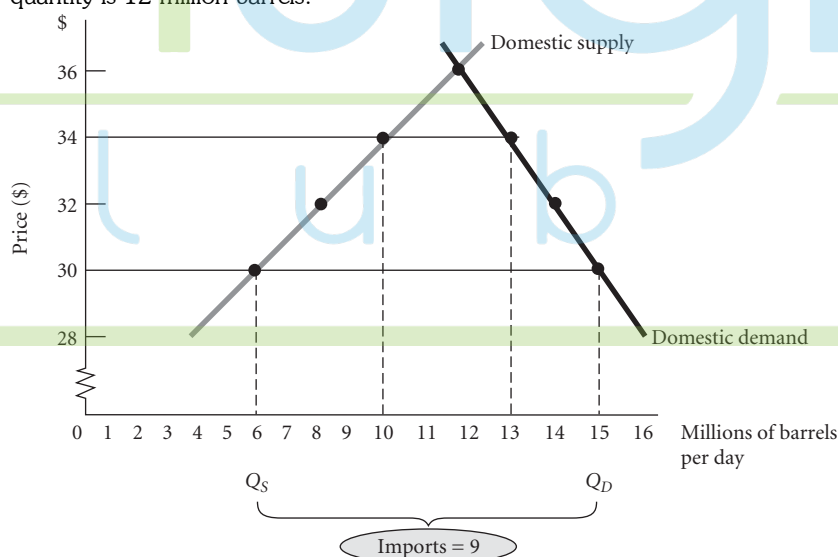
(b) With a price ceiling of $34, quantity demanded equals 13 million barrels, while quantity supplied equals 10 million barrels. There is an excess demand of 3 million barrels.

(c) Quantity supplied will determine the quantity purchased. In a market system, no one can be forced to buy or sell more than he or she wants to. Under conditions of excess demand, suppliers will supply only as much as they want, and some consumer demand will go unsatisfied.

10.   At $8 and 6 million meals: CS = $18 million; PS = $18 million; total = $36 million. At 3 million meals: CS = $13.5 million; PS = $13.5 million; total = $27 million Deadweight loss = $9 million

Millions of meals
per day at Wendy's
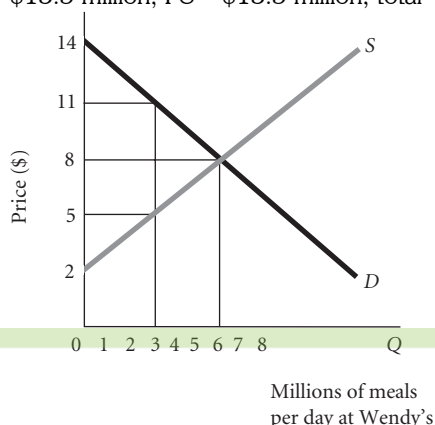
11.   The figure on the left shows that legalization would reduce the cost of supplying drugs and shift the supply curve to the right. A successful advertising campaign would shift the demand curve to the left. The unambiguous result would be a lower price of drugs that would reduce the profitability of production. The relative sizes of the supply shift and the demand shift would determine whether consumption would rise or fall. If the advertising campaign failed to shift the demand curve (as in the figure on the right), the lower price would indeed lead to more consumption. One link between drugs and crime is that consumers who are addicts may commit crimes to pay for or obtain drugs. A lower price of drugs presumably reduces the incentive for this type of crime.
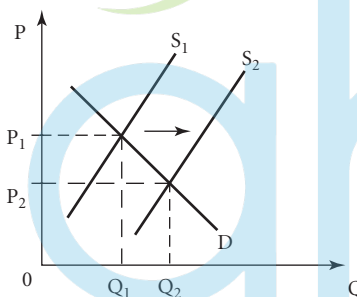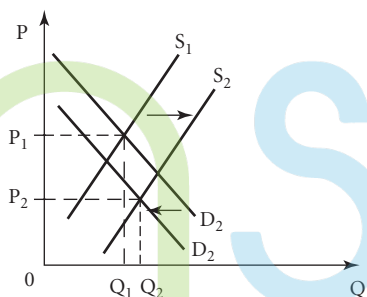
12.   Answers will vary.

CHAPTER 5

1. (a) −1.2 (b) +10% (c) +15% (d) +12% (e) +.67

2. (a) No. Because demand is elastic, an increase in price will lead to a larger percentage decrease in quantity demanded, so revenue ($P \times Q$) will fall if P is increased.
    (b) No. Because demand is inelastic, a decrease in prices will lead to a smaller percentage increase in quantity, so revenue $P \times Q$ will fall if P is cut.

3. (a) % change in $P = −50.0\%$; % change in $Q = +28.6\%$ Elast. = $−.57$
    (b) % change in $P = +23.7\%$; % change in $Q = −15.4\%$ Elast. = $−.65$
    (c) % change in $P = −97.2\%$; % change in $Q = +66.7\%$ Elast. = $−.69$
    (d) % change in $P = +28.6\%$; % change in $Q = −28.6\%$ Elast. = $−1.0$

4. (a) Between Points A and B: −3.666. Between Points C and D: −1. Between Points E and F: −0.273.
    (b) Starting at $50, revenues would fall by $4,000, from $10,000 to $6,000. Starting at $30, revenues would remain constant at $12,000. Starting at $10, revenues would rise by $4,000, from $6,000 to $10,000.
    (c) When demand is elastic (e.g., between Points A and B), a price increase will lead to a revenue decline. When elasticity is unitary (e.g., between Points C and D), a price increase will leave revenues unchanged. When demand is inelastic (e.g., between Points E and F), a price will increase revenue.

5. a. Disagree. Buyers will spend more. Since demand is inelastic, the percent decline in quantity demanded is *less* (in absolute value) than the percent increase in price. Thus, total expenditure, P times Q, will rise.

b. Disagree: They will gain revenues. If demand for tress is elastic (–1.3), the percent increase in quantity of trees demanded will be *greater* than the percent decrease in price. Thus, total revenues collected by vendors will rise. P times Q will be larger.

c. Disagree: If demand has unitary elasticity, then the percent change in quantity and the percent change in price are exactly equal. Thus, total revenues, P times Q, will not change if price rises. The increase due to the higher price will be exactly offset by the decrease in quantity demanded.

6. (a) Disagree. The top half of the demand curve is elastic.

(b) Disagree. Price would fall but firms would earn more revenue because demand is elastic over the range of prices shown in the graph.

7. Total revenue is $P \times Q$. When price rises (cab fare goes up), quantity demanded goes down, by an amount that depends upon the elasticity of demand. Cab drivers who were expecting a 10% increase in revenues were expecting *no* loss of riders. These cab drivers expected demand to be perfectly inelastic.

In fact, revenues did increase, but by less than 10%. Since revenues increased, the percentage increase in price was *more* than the percentage decrease in quantity demanded. Therefore, demand was *inelastic*, just not perfectly so.

8. (a) %DQ4%DP = 0.2

Thus, %DP = %DQ4 0.2 = 10%40.2 = 0.10 4 0.2 = 0.50 = 50%. Price would rise to $2.10.

(b) A price ceiling at $1.40 per gallon would create a shortage of gasoline. The result might be long lines at gas stations and perhaps a black market in gasoline.

9. Answers will vary.

CHAPTER 6

1. Answers will vary because the question asks for personal choices; however, it is likely that students may offer some of the following in response:

(a) If other prices and your income remain constant, you are likely to see your friend less frequently. Of course there may be available substitutes. You may have a car and you might drive more often. A discount airline or a train may now have relatively cheaper ways to get there.

(b) Students might consume more of other goods (e.g., movies, clothing) because with lower tuition they have more money to spend on other things. They may also work fewer hours, assuming they mostly work to pay tuition. Instead of spending more, they may also save the money they did not have to spend on tuition.

(c) This represents an increase in income for the next five years; again, students may spend it on any number of goods, may use that added income to allow them to work fewer hours, or may save it (resulting increased saving).

(d) A higher interest rate could have a positive or negative impact on saving. First of all the opportunity cost of spending today is higher. Thus, households would tend to save more (substitution effect). On the other hand, if you already have a lot of saving, you will earn a higher return on it, and you will have to save less than you did when interest rates were lower to achieve the same level of income in your retirement (income effect). If you have savings, the higher return will give you more income. If, on the other hand, you are a net borrower, then the interest rates on your loans may increase, making you worse off. Answers will also vary.

(e) Having to spend more money on food will likely leave students with less money to spend on other goods (e.g., movies, CDs, etc.), and may mean they have to work more hours. Students may also draw down savings or just save less as a result of increased expenditure on food. (This assumes that they do not drastically decrease the amount of food consumed as a result of the higher price!)

(f) Students may work more hours because of the high wage or may work fewer hours since they are earning so much more per hour (than minimum wage, for example). If the result is higher income, students will buy more of any number of goods (including leisure). They may also be able to save more.

2.
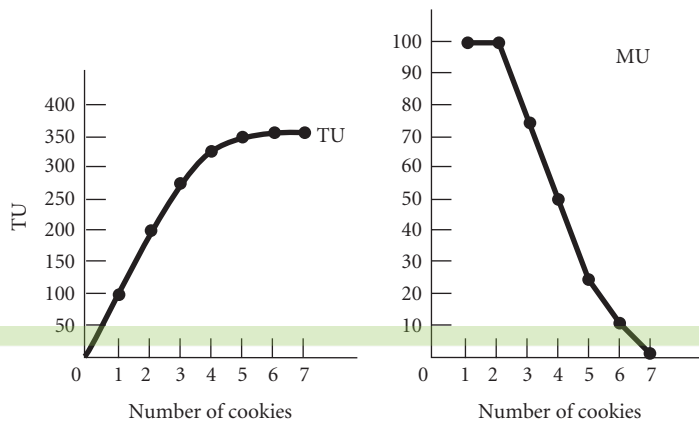
# of Cookies	Marginal Utility
1	100
2	100
3	75
4	50
5	25
6	10
7	0

The maximum that he would buy would be 6 because the seventh yields no marginal utility.

3. (a) She can no longer afford to buy the same combination of things that she bought last year. Her real income is lower. Something has to give—her budget constraint changed. So, she must cut back on some things, and her preferences dictate that concerts and clothing takes a hit.

(b) She is worse off—her real income is lower—she will reduce consumption of normal goods including air trips home; this is the income effect. In addition, the opportunity cost of a trip home increases from $350 to $600. Thus, Kamika will be pushed to substitute other goods for air travel. This is the substitution effect.

(a

(b)

4.
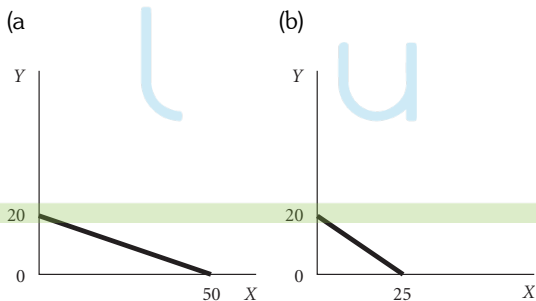
(c
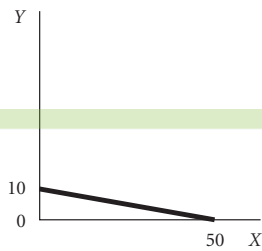
(d)
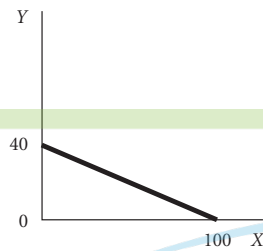
(e
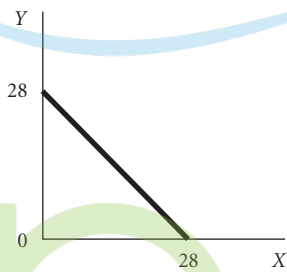
(f)
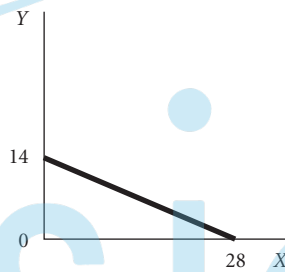
(g
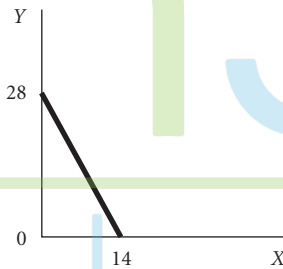
5.   (a,c)
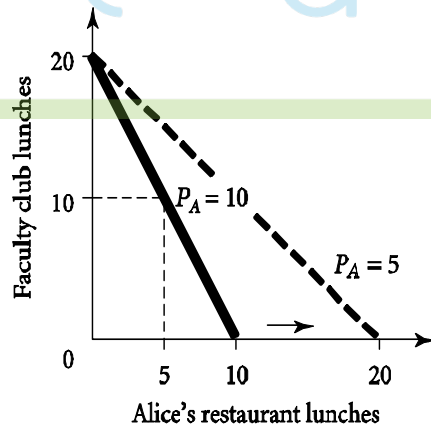
(b   10 lunches at the club, and 5 at Alice's cost a total of $10 \times \$5 + 5 \times \$10 = \$100$. This is within the budget constraint.

Chinese (y-axis): 20, 10, 6, 5, 4, 0
Zanzibar (x-axis): 2, 5, 8, 10, 20
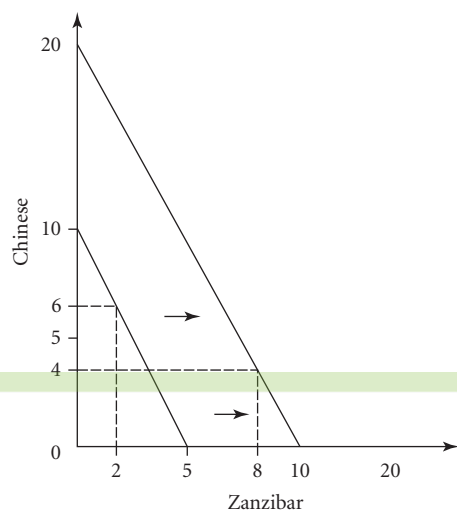
6. This statement is backwards. An increase in the "after tax" wage will have a positive effect on the labor supply only if the substitution effect outweighs the income effect. The substitution effect states that a higher wage makes the opportunity cost of leisure increase. Thus, people tend to substitute working for leisure. The substitution effect alone suggests that a higher after tax wage leads to more labor supply. On the other hand, if the after tax wage goes up, people are better off. Assuming leisure is a normal good, the higher wage suggests that people will consume more leisure and work less.

7. (a, b)

(c) Zanzibar is a normal good; Chinese food is an inferior good. As income rises, Zanzibar consumption rises but Chinese food consumption falls.

(d) The entire effect is due to an income effect. Mei is clearly better off, but the opportunity costs haven't changed because the prices have not changed! The cost of a Zanzibar trip in terms of meals sacrificed has not changed.

8. (a) Disagree. If the income effect of a wage change dominates the substitution effect, we know that a wage increase will cause additional consumption of leisure and less work . . . and that lower wages will cause additional work . . . increased labor supply. Thus, if our household works more it must have been a wage cut.

(b) Disagree. In product markets, a price cut makes households better off . . . higher real income. Thus, for normal goods, the income effect leads to *more* consumption of the good.

9. (a, c)

y-axis: 100, 50, 25, 20, 0
x-axis: 50, 100, 160, 200
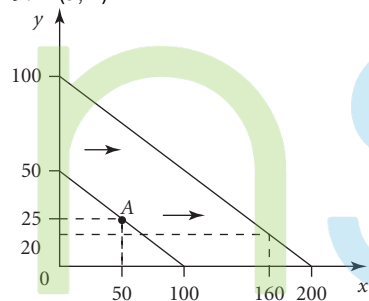
(b) As shown on the graph, the household ends up at Point A, buying $50X$ and $25Y$.

(d) X is a normal because consumption increases from 50 to 160. Y is inferior because consumption decreases from 25 to 20.

10. (a)

	Movies				Books		
# PER MONTH	TU	MU	MU/$	# PER MONTH	TU	MU	MU/$
1	50	50	6.25	1	22	22	1.10
2	80	30	3.75	2	42	20	1.00
3	100	20	2.50	3	52	10	.50
4	110	10	1.25	4	57	5	.25
5	116	6	.75	5	60	3	.15
6	121	5	.63	6	62	2	.10
7	123	2	.25	7	53	1	.05

(b) Yes, these figures are consistent with the law of diminishing marginal utility, which states that as the quantity of a good consumed increases, utility also increases, but by less and less for each additional unit. In the tables, the *TU* figures for both books and movies are increasing, but as more movies or more books are consumed, the *MU* diminishes.

(c) Five movies and two books. To maximize utility, the individual should allocate income toward those goods with the highest marginal utility per dollar. The first four movies have a higher marginal utility per dollar than the first book, so the person begins by seeing four movies for $32. The first book has a higher marginal utility than the fifth movie, so now the person should buy a book, for total expenditure of $52. Next, the second book, for total spending of $72. And finally, the fifth movie, for total spending of $80.

(d) See graph below.

(e) If the price of books falls to $10, only the $MU/\$$ column for books needs to be recalculated:

# PER MONTH	Books TU	MU	MU/$
1	22	22	2.20
2	42	20	2.00
3	52	10	1.00
4	57	5	.50
5	60	3	.30
6	62	2	.20
7	63	1	.10

(f) Now, using the same logic as in (c) above, this individual should purchase six movies and three books, for a total expenditure of 6 3 $8 = $48 + 3 x $10 = 78.

(g) See graph below.

(h) The decrease in the price of books increases the purchasing power of the individual's income. this increase in purchasing power—or income effect—will be used to purchase more of one or both goods, depending on the individual's tastes. In this case, the individual chooses to use his or her "increased income" to buy more of both goods.

(Note: Another answer to (f) is 5 movies and 4 books. This choice uses up the entire $80, and it results in the same total utility as 6 movies and 3 books.)

11.   Since we assume that everyone has a limited income or wealth, it must be the case that there is some price at which one cannot afford even one unit of a good. No matter how badly someone wants a good, there must be some price at which they cannot afford it.

CHAPTER 6 APPENDIX

1.   The figure to the left violates "more is better" because the indifference curve has a positive slope. You cannot get more of both goods and be indifferent. Indifference curves cannot "curl upward." The figure to the right violates "diminishing marginal rate of substitution." This shape would imply that MU_x/MU_y increases as you consume more X and less Y. The opposite is true.

2. $I/P_{x1}=100$ and I=100, thus P_{x2}=$1.50
         (Point A on demand curve).

     $I/P_{x2}=200$ and I=100, thus P_{x2}=$.50
         (Point B on demand curve).

     $I/P_{x3}=300$ and I=100, thus P_{x3}=$.60
         (Point C on demand curve).

3.   Agree. Since $MU_x/MU_y = 5 > P_x/P_y = 9.00/2.00 = 4.50$ $MU_x/P_x = MU_y/P_y > MU_y/P_y$. The MU per dollar spent on X is greater than the MU per dollar spent on Y. She should substitute X for Y to increase utility. Moving from A down to the right will increase utility.

4.

(a)   We know that $P_A A + P_N N = 100 \rightarrow 5N + 10A = 100$. We also know that $MU_N / MU_A = A/N = P_N/P_A = 5/10 \rightarrow N = 2A$. Substituting, we find that $5(2A) + 10A = 100 \rightarrow A = 5$; $N = 10$.
(b)   If $P_N = 10$, $N = 5$ and if $P_N = 2$, $N = 25$.
(c)   Answers will vary, but graph should show an indifference curve tangent to a budget constraint drawn for $P_A = \$10$ and $P_N = $ to one of the prices given in the answer to (b).

CHAPTER 7

1.   Total revenue is $50,000 ($10 3 5,000). The opportunity cost of the capital is 10% of $100,000 annually or $10,000. Total cost, including opportunity costs, is $45,000 for labor plus $10,000 for capital or $55,000. Profit is TR-TC or $50,000 – $55,000 = –$5,000. The firm is suffering a $5,000 loss in economic terms.

2.   They are not earning economic profits; they are not considering opportunity costs. The opportunity cost of capital is 10 percent of $50,000 annually, or $5,000. Because simple revenue minus cost yields an accounting profit of only $2,000, adding $5,000 in opportunity cost means the firm is suffering losses of at least $3,000. In addition, they are not considering the opportunity cost of their own labor.

3.   The size of the theater is the fixed factor. Decisions include how to divide up the tickets, what price to charge, what shows to put on, and what kind of stage sets to use. All are constrained by the scale of the theater. In the long run you might be able to raise money and build or acquire a bigger theater. There is no fixed factor in the long run; you can think big!

4.   (a)   The marginal product decreases as a single variable factor increases, holding all other factors constant.
(b)   The table does exhibit diminishing returns because the marginal product of labor falls as labor increases:

L	TP	MP
0	0	—
1	5	5
2	9	4
3	12	3
4	14	2
5	15	1

5.   (a)   Total costs of each technique are as follows:

	$Q = 1$	$Q = 2$	$Q = 3$	$Q = 4$	$Q = 5$
Tech A	$9	$12	$24	$30	$36
Tech B	$12	$19	$26	$33	$38

Technique A is cheaper at all levels of output.
(b)   Labor and capital employed would be as follows:

Q	L	K
1	5	2
2	10	1
3	14	5
4	18	6
5	20	8

(c)

(d)   With the price of labor rising to $3:

	Q = 1	Q = 2	Q = 3	Q = 4	Q = 5
Tech A	$19	$32	$52	$66	$76
Tech B	$16	$25	$34	$43	$50

Labor and capital employed would be as follows:

Q	L	K
1	2	5
2	3	8
3	4	11
4	5	14
5	6	16

6.   Clearly, the labor-intensive way would be to carry the boxes down the hall and up the stairs one at a time. She could get a friend or two to help. If the dorm has an elevator and she can borrow a hand truck, the job would be a piece of cake. She would be using capital to raise her productivity. To go three miles across campus, a car (capital) or a truck (more capital) would be nice, although she could carry the boxes one at a time across campus as well. In the developing world, where capital is scarce, people carry a lot of stuff. To get the boxes to a new campus, she would probably mail them or send them UPS. In this case, they would go in a big truck or in an airplane (a whole lot of capital).

7.   (a)

(b)   Yes, the marginal product drops from 10 units and 5 units after 100 units of labor have been used.

8.   The addition of capital (tractors, combines, etc.) and the application of technology (nitrous fertilizers) raise the productivity of labor, just as the new grill discussed in the chapter raised the productivity of workers. Capital is also a substitute input for labor.

9.   (a

Number of Workers (Per Week)	Number of Repairs	MP_L	AP_L
0	0	—	—
1	8	8	8.00
2	20	12	10.00
3	35	15	11.67
4	45	10	11.25
5	52	7	10.40
6	57	5	9.50
7	60	3	8.57

(b)   Between 1 and 3 workers, there are increasing returns to labor (MP_L increases as more workers are hired). From 3 to 7 workers there are diminishing returns to labor (MP_L decreases as more workers are hired). There is no range of employment where returns to labor are negative, because MP_L is always positive.

(c)   Marginal product is greater than average product for the second and the third worker, and average product rises as these two workers are hired.

(d)   Marginal product is less than average product for the fourth, fifth, sixth, and seventh workers. As each of these workers is hired, the average product of labor declines.

10.   (a)   Tall buildings—skyscrapers.

(b)   Product usually has to move along an assembly line and out into a warehouse. An assembly line usually takes a lot of space on a single floor. (Can you imagine a vertical assembly line?)

(c)   Offices can be "stacked up." People can move by stairs or elevators easily.

(d)   Accessibility!

(e)   The area of land increases with the square of distance from the center: When a city grows from a radius of 1 mile to a radius of 5 miles, the new area is 25 times as large as the original: Area = pR^2.

11.   (a)   The opportunity cost of capital is the interest that could have been earned in another enterprise or by holding another financial asset.

(b)   They represent lost opportunity to obtain income.

(c) $1,000,000 times 10%, or $100,000.

(d) $250,000 less $100,000, or $150,000.

12.   (a)   The first step is to calculate the cost for each level of output using each of the three technologies. With capital costing $100 per day, and labor costing $80 per day, the results are as follows:

Daily Output	Technology 1	Technology 2	Technology 3
100	860	800	820
150	1,100	960	900
200	1,280	1,140	1,080
250	1,540	1,400	1,340

From the table, we can see that for output of 100, Technology 2 is the cheapest. For output levels of 150, 200, and 250, Technology 3 is cheapest.

(b) In a low wage country, where capital costs $100 per day and labor costs only $40 per day, the cost figures are as
       follows:

Daily Output	Technology 1	Technology 2	Technology 3
100	580	600	660
150	700	680	700
200	840	820	840
250	1,020	1,000	1,020

       From the table, we can see that for output of 100, Technology 1 is now cheapest. For output levels of 150,
       200, or 250, Technology 2 is now cheapest.
(c) If the firm moves from a high-wage to a lowwage country and continues to produce 200 units per day, it will
       change from Technology 3 (with six workers) to Technology 2 (with eight workers). Employment increases by
       two workers.

CHAPTER 7 APPENDIX

1. $MP_L/P_L = 5/2 > MP_K/P_K = 10/5 = 2$. The MP per dollar spent on labor is higher than the MP per dollar
     spent on capital. The firm should transfer spending from capital to labor, because each dollar spent on labor (at the
     margin) yields more output.

2. At A, $MP_L/MP_K > P_L/P_K$ because the slope of the isoquant is greater than the slope of the isocost. That means
     that $MP_L/P_L > MP_K/P_K$; thus, the firm can cut costs by hiring more labor and less capital.
     At B, $MP_L/MP_K < P_L/P_K$ because the slope of the isoquant is less than the slope of the isocost. That means that
     $MP_K/P_K > MP_L/P_L$; thus, the firm can cut costs by hiring more capital and less labor

3.
Q	TC	L	K
100	100	25	25
200	200	50	50
300	300	75	75

CHAPTER 8

1. The monthly payment and the insurance do not depend on the amount that you drive. They must be paid even if
     you do not drive. Thus, the fixed costs are $418.71 per month. The marginal cost of a mile driven is $1.50
     divided by 20, or 7.5 cents, plus 15 cents for a total of 22.5 cents per mile. The "cost" of a trip to Pittsburgh
     would be $225. Only the variable costs of 22.5 cents × 1,000 miles are incurred as a result of the trip. Some
     would argue that only the interest portion of the monthly payment is a cost because the principal repayment
     represents a form of saving because you will fully own the car in five years. However, you must also account for
     the depreciation on the car. After five years, it will be with less than its original purchase price.

2. At 5 million copies AFC = $6, at 10 million copies AFC = $3 and at 20 million copies AFC = $1.50. If each book
     costs $1.50, and that is true for every book up to 40 million, then the average variable cost of a volume is $1.50
     regardless of how many volumes come off the press, at least up to 40 million. If the producer prints 5 million
     copies, total fixed cost is $30 million, and total variable cost is 5 million times $1.50 or $7.5 million. Thus, total
     cost is $37.5 million and average total cost is $37.5 million divided by 5 million or $7.50. You can get this same
     answer by simply adding average fixed cost of $6 to average variable cost of $1.50. Average total cost of 10
     million books is $4.50. The average total cost of producing 20 million copies is $3.00.

3. Disagree. Firms earning profits will produce to the right to the minimum point on the average total cost function. See diagram below:

Firms will produce at q^*, where P = MC. At q_1 ATC is minimized but the firm can increase total profit by continue to produce up to q^* because P > MC. For units between q_1 and q^*:

4. (a)

Q	TVC	AVC	MC
0	0	—	—
1	45	45	45
2	85	42.5	40
3	120	40	35
4	155	38.75	35
5	195	39	40
6	240	40	45
7	290	41.43	50
8	345	43.13	55
9	405	45	60
10	470	47	65

(b) Yes. Given diminishing returns, MC may fall at first but should eventually rise with output.

(c) When MC is below AVC, AVC falls; when MC is above AVC, AVC rises. At 3 units of output, $MC = 35 < AVC = 40$, thus AVC falls. At 6 units, $MC = 45 > AVC = 40$, thus AVC rises.

(d) Marginal cost is the added cost of the resources needed to increase output one unit. The *MC* of the sixth unit of output, for example, is $45; 2 units of K at $10 each plus 5 units of L at $5 each.

(e) The firm would increase production as long as *P* > *MC*. The optimal level of output would be 8.

5. (a) Disagree. Firms would not increase output if price were below marginal cost because that would *decrease* profits.

(b) Disagree. Even if marginal cost is rising with output, average cost will decline if marginal cost is *below* average cost.

(c) Disagree. Fixed cost is constant and must be paid even at zero output.

6. (a)

Q	TC $	TFC $	TVC $	AVC $	ATC $	MC $
0	100	100	0	–	–	–
1	130	100	30	30.00	130.00	30
2	150	100	50	25.00	75.00	20
3	160	100	60	20.00	53.33	10
4	172	100	72	18.00	43.00	12
5	185	100	85	17.00	37.00	13
6	210	100	110	18.33	5.00	25
7	240	100	140	20.00	34.29	30
8	280	100	180	22.50	35.00	40
9	330	100	230	25.56	36.66	50
10	390	100	290	29.00	39.00	60

(b)

When *MC* is below *ATC(AVC)*, *ATC(AVC)* is decreasing. When *MC* is above *ATC(AVC)*, *ATC(AVC)* is increasing.

(c) 7 units

$$TR = 7 \times \$30 = \$210$$

TR – *TC* = $210 – $240 = –$30 loss of $30.

(d) 9 units

$$TR = 9 \times \$50 = \$450$$
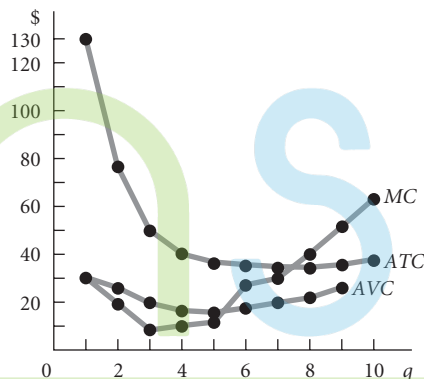
TR – *TC* = $450 – $330 = $120 profits

(e) Because a price of $10 is below the minimum *AVC*, the firm should shut down and incur only fixed costs, for a total loss of $100.

7. (a) Marginal cost is a constant $1 from one unit of output up to 100 units because the most efficient machine will be used. From the 101st unit to the 300th unit, MC is constant at $2. From the 301st unit to the 800th unit, MC is constant at $3.

Total cost is $100 at zero units of output and rises by $1 per unit up to a total of $200 at 100 units of output. From 101 units of output up to 300 units, total cost increases by $2 per unit up to a total of $600. After that it rises at $3 per unit to a total of $2,100 at 800 units of output.

(b) At a price of $2.50, the company should produce 300 books. The MC of the 301st book is $372.50. $TR = 750$, $TC = \$600$, and profit = $150
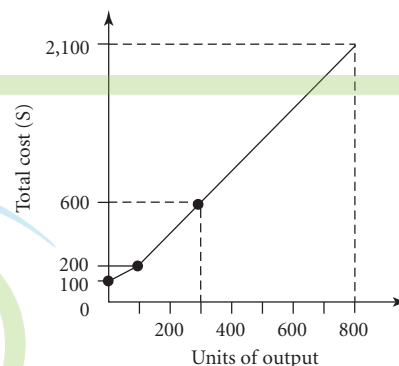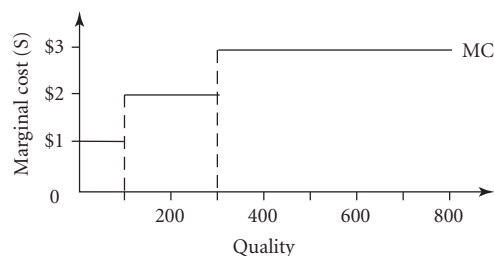
8.
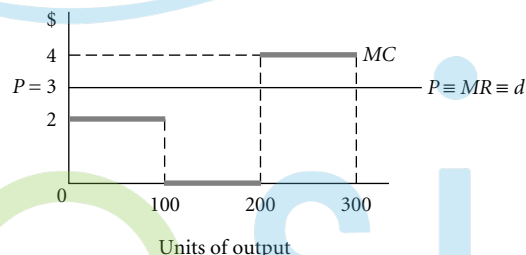
If $P = \$3$ the optimal q is 200.
At output below 200 $P > MC$.
At output above 200 $P < MC$.

9.   (a)   (b)
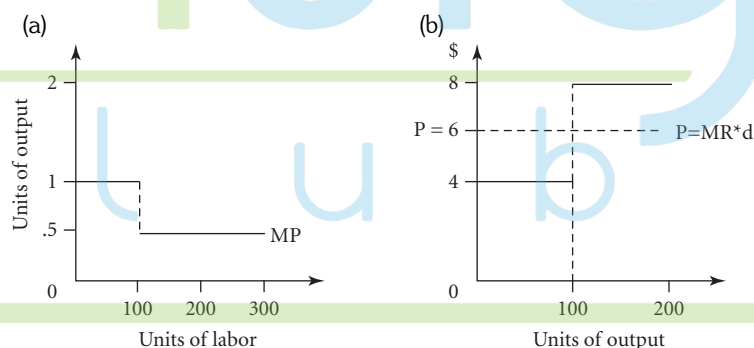
(c) The profit-maximizing level of output is 100 units. the firm will hire 100 units of labor.

10. (a) The table gives the marginal product from each day's efforts: 100, 80, 60, and 40 kg.

(b) Marginal cost of a kg of fish is the change in cost divided by the change in q. During prime season, each day brings in 100 kg of fish at a cost of 6,000 levs, or $6,000/100 = MC = 60$ levs. During month 7, it's $6,000/80 = MC = 75$ levs. During month 8 it's $6,000/60 = MC = 100$ levs. During the rest of the year it's $6,000/40 = MC = 150$ levs.

(c) Produce as long as price, which is marginal revenue (80 levs), is greater than MC. Thus, the boat should be in the water fishing during prime season and month 7, but should not fish during month 8 or during the rest of the year.

11. (a) The land.

(b) The fixed capital—the kitchen and the dining area.
(c) The office, the dental equipment, and, in a way, the dentist's time (the most he can work is 24 hours a day).
(d) The land (parking for inventory of cars), showroom and service area, and installed equipment.
(e) The branch buildings and major equipment like automated teller machines.

CHAPTER 9

1. (a) Disagree. Constant returns to scale means that the long-run average cost curve is flat over most of its range.
    (b) Disagree. A firm suffering losses will continue to operate as long as total revenue covers variable cost.

2. The enterprise is suffering a $20,000 economic loss. $TR = \$100,000$, $Px\ q = \$5 \times 20,000$, $TC = \$120,000$. Fixed costs are $30,000 (10% annually on $300,000: the opportunity cost of capital). That makes $TVC = \$90,000$ ($TC–TFC = 120,000 - 30,000$). Thus, revenue covers variable cost, profit on operations is $100,000 - 90,000 = 10,000$. The firm should operate in the short run but exit in the long run.

3. Increasing returns is a reduction in average costs in the long run, when all inputs can be optimally adjusted. Diminishing returns is an increase in marginal costs in the short run, when only one input can be varied and others are held fixed.

4. One could make a case that some economies probably exist in all five, but the case is much stronger in electric power (needs a big power plant or dam) and aircraft manufacturing (requires a big assembly line and a great deal of cooperation).

    Home Building: Home building is usually done by very small independent contractors, although there are some big tract developers (like Ryan Homes) that produce tens of thousands of homes each year. They do quantity buying and use mass-produced parts.

    It is hard to find economies of much significance in *software development* and *vegetable farming*. Although some firms in those industries are large, many are quite small and quite competitive.

5. The key is to calculate $TVC = TC - TFC$ in each case. Whenever $TR > TVC$ (as in cases A, B, D, and F), the firm should stay open. When $TR < TVC$ (cases C and E),the firm should shut down immediately. In the long run, the firm should exit when $TR < TVC$ (as in cases C, D, and E).

6. (a) Disagree. A firm will never sell its output for less than the marginal cost of producing it, but may indeed sell at less than average total cost, as long as it can earn an operating profit.
    (b) Disagree. The short-run marginal cost curve assumes at least one input is fixed. The long-run average cost curve allows all inputs to vary. For example, the short-run MC curve for each fixed level of capital could be U-shaped, and yet the $LRAC$ curve could be flat (constant returns to scale).

7. To look for economies of scale, you need to calculate average total cost. For the three farms, ATC is: Smythe $1.12, Faubus $.91, and Mega $.91. This suggests that in moving from producing 28,000 chickens to producing 55,000 chickens, average cost falls, thus indicating economies of scale. But in moving from 55,000 to 100,000, average cost doesn't change, thus indicating constant returns to scale.

8. (a) Disagree. Constant returns to scale means that the long-run average cost curve is flat over most of its range.
    (b) Disagree. The supply curve of a competitive firm is its marginal cost curve above the average variable cost curve. At any point above AVC, total revenue is greater than total variable cost and firms will choose to operate.
    (c) Disagree. A firm suffering losses will continue to operate as long as total revenue covers variable cost.

9. The firm will produce 4 units of output—Above 4 units MC rises above $P = MR = 7$. $TR = \$28$, $TC = \$32$, losses = $4. It will operate in the SR as $TR > TVC$. It will exit in the long run.

Q	MC
0	—
1	5
2	4
3	5
4	6
5	8
6	10

10. Answers will vary.

11. (a)

Output	TFC	TVC	TC	AVC	ATC	MC
0	$300	$0	$300	—	—	—
1	$300	$100	$400	$100.00	$400.00	$100
2	$300	$150	$450	$75.00	$225.00	$50
3	$300	$210	$510	$70.00	$170.00	$60
4	$300	$290	$590	$72.50	$147.50	$80
5	$300	$400	$700	$80.00	$140.00	$110
6	$300	$540	$840	$90.00	$140.00	$140
7	$300	$720	$1,020	$102.86	$145.71	$180
8	$300	$950	$1,250	$118.75	$156.25	$230
9	$300	$1,240	$1,540	$137.78	$171.11	$290
10	$300	$1,600	$1,900	$160.00	$190.00	$360

(b)

Price	Quantity Supplied	Profit
$50	0 (shut down)	−$300
$70	0 (shut down) or 3	−$300
$100	4	−$190
$130	5	−$50
$170	6	$180
$220	7	$520
$280	8	$990
$350	9	$1,610

(c)

Price	Market Quantity Supplied	Market Quantity Demanded
$50	0	$1,000
$70	Between 0 and 300	900
$100	400	800
$130	500	700
$170	600	600
$220	700	500
$280	800	400
$350	900	300

(d) Fill in the blanks: From the market supply and demand schedules given, the equilibrium market price for this good is $170 and the equilibrium market quantity is 600. Each firm will produce a quantity of 6 and earn a profit equal to $180.

(e) The equilibrium in this market is not a long-run equilibrium, because firms are making profits, entry will occur. Entry will increase quantity supplied, and this will decrease equilibrium price until each firm is making zero profit.

12. (a, b)
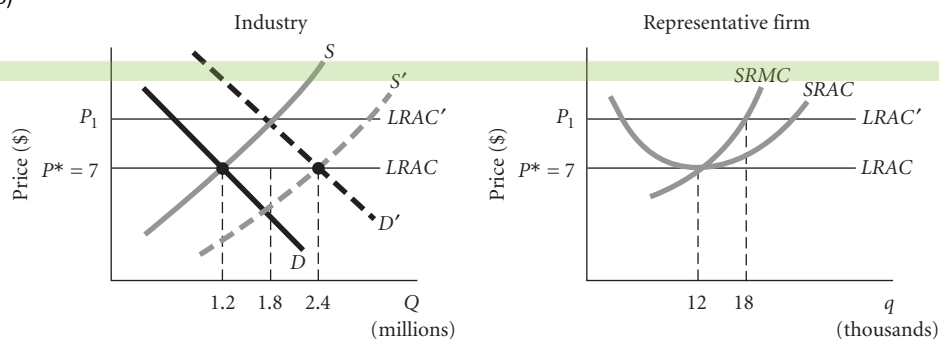
(c) In the short run, demand shifts from D to D', and price rises to P_1. Firms are making profits, and they raise output to 18.

In the long run, 100 new firms enter the industry. Supply shifts from S to S', and price falls back to $7.

CHAPTER 9 APPENDIX

1. Disagree. In the long run, expansion in an industry may cause input prices to increase. This is one reason for external economics of scale––in this case, external diseconomies. The text provides an example of this case in the housing industry, where an increase in industry size drove up the price of lumber.

2. See the story in the text and Figure 9A.2 for an increasing-cost industry.

3. In a constant-cost industry, the LRAC and LRIS curves are flat. As demand shifts right, the supply curve will also shift right in proportion. In the long run, the price will remain at $10, consistent with normal profits. Since there are constant returns to scale, the method of expansion––more firms or bigger firms––is indeterminant.

   Note that without an increase in supply, the ongoing increase in demand would lead to an increase in price, which would create above normal profits. This situation would not be an equilibrium, since above normal profits attract entry. Presumably, if the increase in demand is steady and predictable, the increase in supply will occur at the same pace, and there will be no increase in price or above normal profits.
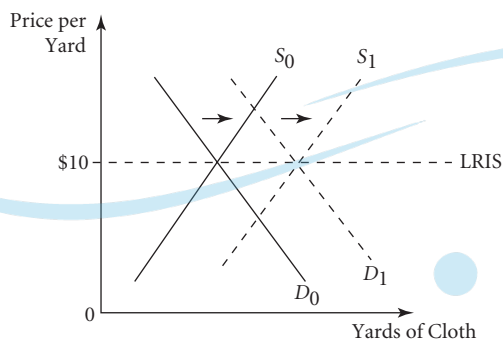
CHAPTER 10

1. The key idea here is that many things affect the supply and demand for labor in manufacturing. Productivity could and did increase during the period raising the marginal revenue product of labor and shifting demand up. However, higher productivity could be labor saving and reduce the demand for labor. The economy did expand as a whole during the period with an increase in population, and immigration was high. Something was happening to demand if all those jobs were created. The question leaves a lot of room for further analysis and raises a lot of questions. What about hours worked? These are weekly wages. What happened to employment in manufacturing? Most of the 16.5 million jobs were in the service sector. Are we talking about nominal wages (in current dollars) or are these figures corrected for inflation? The main point is to understand that wages are determined by supply and demand, but many things can change during a ten year period.

2. (a) Process 1 costs $7 per widget. Process 2 costs $8, and Process 3 costs $10. Process 1 is cheapest.
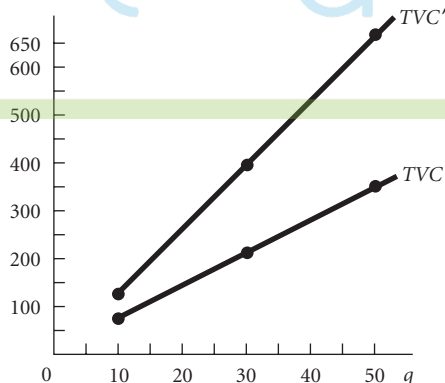
   (b, c) When $q=10$, $K=10$ and $L=40$ –– $TVC = \$70$.
   When $q=30$, $K=30$ and $L=120$ –– $TVC = \$210$.
   When $q=50$, $K=50$ and $L=200$ –– $TVC = \$350$.

(d)   If capital costs $3 and labor costs $4 per unit, then process 3 becomes cheapest, with a cost of $13 per widget.

When q=10, K=30 and L=10 –– TVC = $130.
When q=30, K=90 and L=30 –– TVC = $390.
When q=50, K=150 and L=50 –– TVC = $650.

3. Presumably, there has been a relatively large shift to the right of demand for high-skill labor, and a relatively small shift to the right (or perhaps a shift to the left) of demand for low-skill labor.

One class of explanation for this phenomenon is that high-skill workers have become relatively more productive as compared to low-skill workers, perhaps as a result of changes in production technology driven by information technology. Hence, the MP of high skill workers has risen very fast compared to the MP of low-skill workers.

Another class of explanation is that the relative price of high technology goods (which tend to employ disproportionate numbers of high-skill workers) has risen in the United States, perhaps as a result of more open foreign competition (which tends to be biased toward low-tech goods) or a shift in consumer demand toward high tech products.

Since a firm will hire workers up to the point where the wage equals MP×P, an increase in either MP or P will tend to increase the wage, and a decrease in either MP or P will reduce the wage. Under these arguments, high skill workers are tending to benefit from (some combination of) the increase in their MP and the increase in price of the goods that employ them intensively. Low skill workers, on the other hand, are tending to suffer relative to high-skill workers and in many cases, on an absolute scale (i.e., their real wages are falling).

4.

Workers	Bushels	*MP*	*MRP*
0	0	—	—
1	40	40	$80
2	70	30	$60
3	90	20	$40
4	100	10	$20
5	105	5	$10
6	102	–3	–$6

The firm should hire workers as long as *MRP* < *W*. When *W*= $30, the firm should hire three workers. If W increases to $50, the firm should cut back to only two workers, because the *MRP* of the third worker ($40) is now less than the cost of hiring him/her ($50).

5. (a) MP_L (b) MRP_L
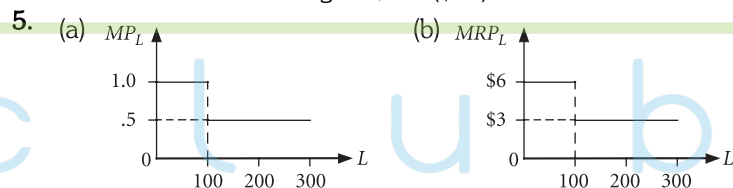
(c) Note that this is the same problem as problem #5 in chapter 7 viewed from another prospective. A profit-maximizing firm would produce as long as MRP_L is greater than the wage rate, the firm depicted above will hire 100 workers and produce 100 units of output.

6. (a   Demand curve for construction workers shifts left; wave decreases; employment decreases.

(b, c) Demand curve for construction workers shifts right; wage increases; employment increases.
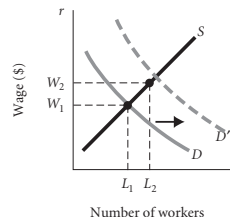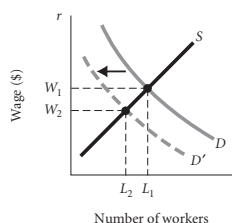
7. Answers will vary depending on the location of the school.

8. Investment tax credits reduce the cost of capital relative to the cost of labor. To the extent that capital is a substitute for labor, these credits can lead to layoffs and slower employment growth.

9. At $6.35, the marginal revenue product of bringing a field to production was sufficient to cover the $25,000 cost at all but field 4. The marginal value of field 4 is 3,000 3 $6.35 = $19,050. He would plant only three fields. At $4.50, only two fields would produce enough potatoes to cover costs. The MRP of field 3 is now only $22,500 (= $4.50 × 5,000). The lower price of potatoes will directly lower the demand for workers on Doug's farm and will likely decrease the value of his land.

10. You would weigh the benefits with the costs. The costs are $40 per week, but the benefits depend on the value of the roommates' time and the displeasure that each gets from mowing. It also depends on their incomes and wealth. There could easily be disagreement. Also, depending on their individual opportunities, one or both of the other two roommates might offer to do the mowing in exchange for money.

11. (a)

Number of Workers	Number of Shirts produced per day	MP_L	TR	MRP_L
0	0	—	$0	—
1	30	30	$90	$90
2	80	50	$240	$150
3	110	30	$330	$90
4	135	25	$405	$75
5	155	20	$465	$60
6	170	15	$510	$45
7	180	10	$540	$30
8	185	5	$555	$15

(b) (1) $TR(170) = \$3 \times 170 = \$510$ and $TR(180) = \$33180 = \$150$, $\therefore MR$ from selling the output produced by the seventh worker = $540 – $510 = $30
    (2) $MRP(7) = \$3 \times 10 = \$30$

(c) The firm should hire workers as long as $MRP_L > W$, subject to the shutdown condition. In this case, if the firm stays open, it should hire six workers. (If labor is the only variable cost, then the firm should indeed stay open, because in this case $TR > TVC$.)

(d) Now the firm should hire only five workers, because the MRP of the sixth worker is only $45, which is less than the wage.

(e) The new technology will double both MP_L and MRP_L at each number of workers. Now, at a wage of $50, the firm should hire seven workers (because the MRP of the seventh worker will be $60, but the MRP of the eighth worker will be only $30).

12. (a) Even though the ratios MRP_L/P_L and MRP_K/P_K are equal, we still have $MRP_L > P_L$ and $MRP_K > P_K$.
    (b) The firm could increase profits by either purchasing more capital or hiring more workers. Either action would add more to revenue than it would add to cost.

13. Answers will vary.

CHAPTER 11

1. All are except (b), (f), and (h).

2. (a) Disagree strongly. Savings is defined as household income minus consumption spending. It is that portion of income set aside for future consumption. Investment is new purchases of capital, plant, equipment, and inventory. Savings in the simple model is done by households and investment is done by firms. What is often confusing is the fact that saving is the source of resources used to finance investment spending.
    (b) Disagree. It is important to remember that when a household buys a share of stock or a bond, it is not investing in the economic sense of the word. Only when new capital is produced does investment take place. If a new firm sells shares to households and uses the proceeds to buy new machinery, the purchase of the new machinery is investment.
    (c) Disagree. Higher interest rates encourage saving but discourage investment. Interest rates determine in part the cost of investment. If the capital investment is financed with borrowing, higher interest rates increase the

cost directly. If capital investment is financed with internal funds by a firm, higher interest rates increase the opportunity cost of the investment.

3. No. The total capital cost of the station is $1 million. With revenues of $420,000 and costs of $360,000, profit is just $60,000, which is a 6% yield on an investment of $1 million. If I can get 7.5% by investing in perfectly safe government securities, why buy a gas station?

4.
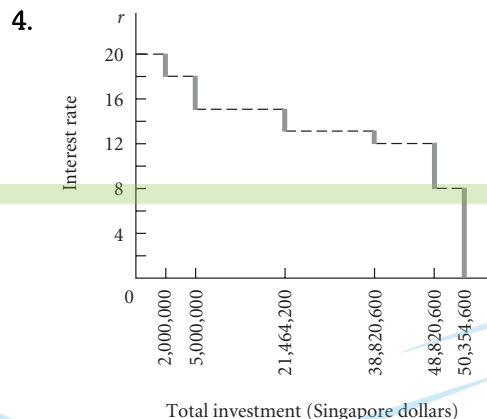
Quando Company should invest in all projects that have a rate of return greater than the interest rate. Therefore, it should invest a total of $48,820,600.

5. When interest rates rise, *ceteris paribus*, one would except the level of investment spending to decline or at least grow more slowly. Investment spending is the demand for capital goods. Since production of capital is generally a good thing, why would the Fed seek to slow it down? The answer is that the Fed worries a lot about inflation, or rising prices. By slowing spending on capital goods, the Fed is seeking to slow inflation.

6. Savings can be borrowed by business firms, which can purchase new technology, engage in research to develop new technology, expand existing plants, or build new plants. Savings can be borrowed from banks or by a firm issuing bonds. Other channels include the stock market and venture capital funds. Savings can be borrowed by individuals, who can invest in human capital (college education, professional school, technical training) or purchase newly constructed houses.

7. Answers will vary. Interest rates differ because of the terms of the loan (how long before the loan is due) and the risk associated with the loan. Longer term interest rates may reflect expectations about future short-term rates. The federal government is considered a safe borrower and pays low interest rates.

8. Households supply the funds (saving), which are used by business firms to purchase capital equipment.

9. Stockholders have put up $100,000 and receive dividends of $30,000. With an interest rate of 10%, $10,000 of this is the normal rate of return. The other $20,000 is economic profit, earned by the stockholders.

10. Physical capital would include the buildings, laboratories, photocopying equipment, chalkboards, desks, and chairs. Intangible capital would include human capital (the education and training possessed by professors, administrators, and staff) and the reputation of the institution.

    The value of the physical capital stock could be measured by estimating how much it could sell for on the open market. The value of intangible capital is much more difficult to assess.

    Other parts of the answer will vary depending on the school, but some examples might be building new dormitories, athletic centers, or libraries and their impact on the school's reputation and on therefore, admissions and tuition revenue, alumni giving, and the ability to secure grants from private and government sources.

11. Answers will vary, but students should refer to assessing how good an investment the purchase of the building would be. They will likely refer to how much of the space is rented and how much is vacant, and what the rent is per square foot. Taxes and other costs would also be relevant. The expectations that matter would also be about the demand for the space and its price, and would be shaped by economic trends affecting vacancy rates.

CHAPTER 11 APPENDIX

1. You would not be willing to pay $1,900 because you can get the same $2,000 by depositing $2,000 divided by 1.1 or $1,818.18 in a 10% account for a year. If you figure on $181.82 in interest, the $1818.18 becomes $2,000 after a year. Thus, $1818.18 is the maximum that you would be willing to pay. For $2,000 after 2 years, your maximum offer would be $1652.89 or $2,000 divided by $(1.1)^2$.

2. The PDV of the inheritance is $\$10,000/(1.065)^{10}$. You should accept your brother's offer. If you invested $6,000 for 10 years at 6.5% you would have $6,000 x $(1.065)^{10}$ = $11,262.

3. Disagree. The bridge cannot be justified on efficiency grounds, because simply investing the $25,000,000 in the financial markets would generate a stream of income worth more to citizens than the benefits from the bridge or stated another way putting $23,786,000 in a bank paying exactly the target rate of return will replicate the earnings from the building. However, at substantially lower interest rates, the *PDV* of the benefits would be higher and might exceed $25,000,000. In that case, the bridge should be built.

4.

	A	B	C	D	E
@8%	$1,000	$1,000	$1,052	$1,092	$1,258
@10%	$924	$903	$1,000	$1,000	$1,208

At 8% interest, flow E is worth a current expense of $1,235 because its PDV of $1,258 would exceed the expense. At an interest rate of 10%, the PDV of $1,208 is less than the current expense so the investment should not be undertaken.

5. (a) $\$3,000/(1.05) = \$2,857.14$.
    (b) $\$3,000/(1.05)^2 = \$2,721.09$.
    (c) $\$1000/(1.05) + \$1,000/(1.05)^2 + \$1,000/(1.05)^3 = \$2,723.25$.

6. (a) $\$3,000/(1.10) = \$2,727.27$.
    (b) $\$3,000/(1.10)^2 = \$2,479.34$.
    (c) $\$1,000/(1.10) + \$1,000/(1.10)^2 + \$1,000/1.10)^3 = \$909.09 + \$826.45 + \$751.32 = \$2,486.86$.

7. (a) False   (b) True

8. Less than 7%. If I can get the same flow of profits by depositing $234,756,000 in a bank paying 7%, and I actually pay $254,000,000 for it, I am earning less than 7% on that investment.

9. Of course not. X is the amount of money I would have to give to the other person to get the three $100 payments. If I can get them from the other person for $260.05. why would I give you $270?

CHAPTER 12

1.
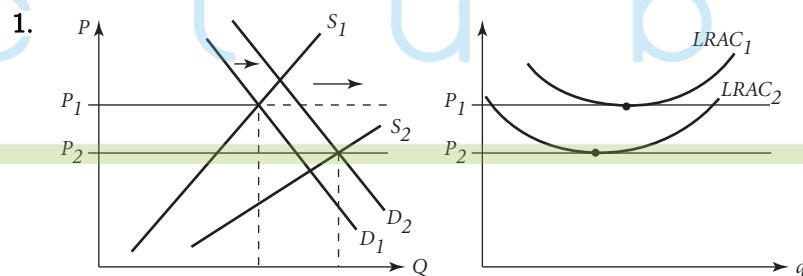
Supply shifts right from lower costs and entry of new firms. Demand shifts right and consumers increase quantity demanded. *LRAC* shifts down.

2. Disagree. Even if shareholders are made worse off, the breakup could be a potential Pareto improvement. The term *efficient change* is often used to describe changes in which some are made better off and others worse off but in which those who gain receive benefits that are greater than the costs imposed on those who lose. The theory of the court is that consumers will gain more than shareholders lose, making the breakup efficient.

3. Certainly the demand for labor will drop. This will put downward pressure on wages. As people lose their jobs income falls, and those who see lower wages or who are laid off consume less. There will be less borrowing in financial markets. The housing and office markets in San Jose will experience a decline in demand and possibly falling prices. Firms that were servicing the high tech sector with banking or legal services will find themselves in a slump. There are dozens of other connections that can be made.

4. (a) First, calculate MP and $P \times MP$:

Workers	Loaves of Bread	MP	$P \times MP$
0	0	—	—
1	15	15	210
2	30	15	210
3	42	12	168
4	52	10	140
5	60	8	112
6	66	6	84
7	70	4	56

At a wage of 119 koruna per hour, 4 workers should be hired. The fifth worker would produce less value in an hour (112 koruna) than his/her wage.

(b) When the price of bread rises to 20 koruna, the last column must be recalculated.

Workers	$P \times MP$
0	—
1	300
2	300
3	240
4	200
5	160
6	120
7	80

Now, 6 workers should be hired.

(c) If the wage rises to 125 koruna per hour, assuming bread still costs 20 koruna, only 5 workers should be hired. (If bread still costs 14 koruna, as in the first example, only 4 workers would be hired.)

(d) Yes, the allocation of labor would be efficient because each firm would hire labor until the wage was equal to the value of the marginal product of output. If all firms paid the same wage, they would all have the same marginal product of labor, and no reallocation of labor could increase total output.

5. There will likely be trade between Country A and Country B. Country A will produce only corn and no soybeans, and Country B will produce only soybeans and no corn. Country A will then trade some of its corn for soybeans from Country B (at the same time, Country B is therefore trading some of its soybeans for corn from Country A). This is Pareto efficient because each good is being produced by its more efficient producer, and both countries are likely to have more or both goods with trade than without it.

6. (a) Disagree. The enjoyment of housing can be limited to those who pay for it. Therefore, the private market will supply it. However, housing, if it is attractive, may produce an externality in the nature of a public good.

(b) Disagree. Monopolies produce too little product and charge an artificially high price.

(c) Agree. It is difficult for consumers to evaluate the skills of a doctor or to judge the advice a doctor gives them.

7. All are examples of potentially Pareto efficient changes.

(a) Both parties are better off; no one else is worse off.

(b) Monopolist is hurt but gains to consumers are greater—enough to compensate losers.

(c) If we assume that the taxes were being used wisely, this still might be an efficient change. Let's assume that the revenues are made up by a new tax that does not distort consumer choices. The argument here is that taxes produce extra or excess burdens when they distort consumer choices. As the result of the repeal, some people buy sweaters, gaining utility over what they were buying before.

(d) Simple elimination of waste is clearly efficient.

8. The cost of chicken is likely to go up. Substitutes for chicken include fish, turkey, and perhaps pork and beef. In each of these markets, the demand curve will shift right, and both equilibrium price and equilibrium quantity will rise. Complements might include rice and canned and packaged chicken gravy. The demand curves for these goods would shift left, causing both equilibrium price and quantity to decrease. In the market for farmland, we might see more acreage devoted to substitutes when the anchovies disappear because the demand for substitutes will increase, as will their equilibrium prices.

9. (a-b) The coin toss is more "equitable," because both parties have the same chance of winning, regardless of their incomes. However, with the coin toss, there is no guarantee that the party who places a higher value on the ticket most will get it. Selling the ticket to the higher bidder is more "efficient," because whoever places the higher value on the ticket will get it, but it is less equitable, because it favors those with higher incomes. You could argue that both are efficient because in the coin toss even if the low bidder gets the ticket he will sell to that high bid.

    On the other hand, the coin toss will also be efficient if the winner can sell the ticket to the loser. In this case, if the party who places a lesser value on the ticket wins the toss, he or she can sell the ticket to the other party.

10. Demand for G shifts left (from D_0 to D_1), driving down the price of G from P_0 to P_1 and creating losses in the short run for firms in G. Demand for S shifts to the right, causing the price of S to rise from P_0 to P_1 and creating short-run profits for firms in S. In the long run, firms exit G, shifting the supply curve left (from S_0 to S_1), driving the price of G back up to P_0 and eliminating the losses. At the same time, firms will enter S, shifting the supply curve to the right (from S_0 to S_1) and driving price back down to P_0 eliminate profits. In the long run, employment will expand in S and shrink in G.
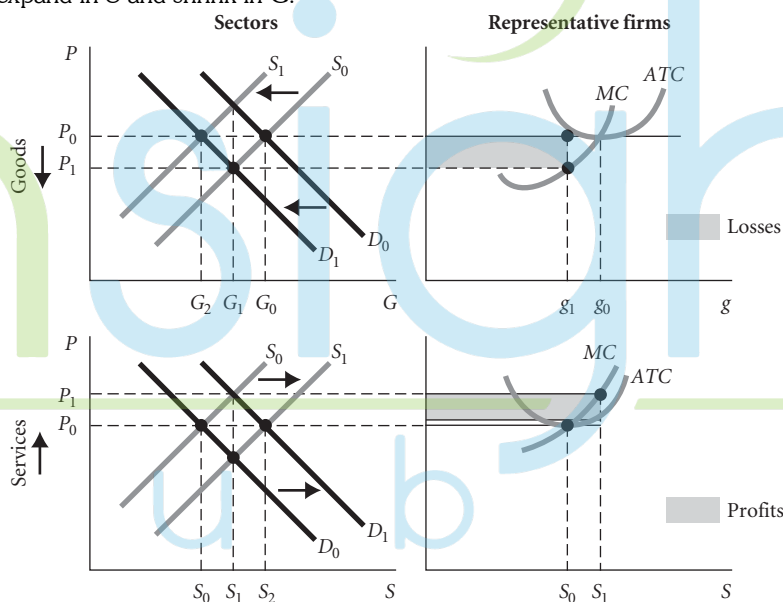
11. (a) Pareto efficient. Both you and the street vendor benefit.
    (b) Pareto efficient. You are better off (you don't die) and the vagabond is better off (by $10,000). Given your circumstances, this is a voluntary exchange.
    (c) Not Pareto efficient. Not a voluntary exchange, and you are worse off.
    (d) Not Pareto efficient. You and the cab driver are better off, but you are also adding to traffic congestion that will make other rush-hour travelers worse off.

12. (a) Imperfect information—you don't know enough about cars to recognize whether or not you need the repair.
    (b) Public good—there is no way to limit enjoyment of the park to those who pay, so the market will not provide it.
    (c) Negative externality—there is a byproduct to this activity that affects (harms) parties outside the transaction of buying the album.

(d)   Imperfect competition—these firms are not acting like pricetakers. Their decision to raise price above marginal cost will restrict output (ticket sales) below the efficient level.

13. The allocation of labor is inefficient. Since each factory is hiring the profit maximizing number of workers (where $W = P_X \times MP_L$), the value of the marginal product of labor in factory A is \$10, whereas that in factory B is only \$6. If workers were moved from factory B to factory A, the value of total output would rise.

CHAPTER 13

1. (a)   Disagree. A Monopolist chooses quantity so that sets $MC = MR$, but then charges a price higher than MR. This is because a monopolist faces a downward-sloping demand curve. To sell more output, it must lower its price.

(b)   Disagree. Demand still constrains monopoly. There are always substitutes (however distant) for a monopoly's output. A rise in price causes a decrease in sales, and may or may not decrease total revenue. But there is only one price that will maximize a monopoly's profits.

(c)   Agree. Demand elasticity is equal to -1 at the midpoint of the demand curve, and the marginal revenue curve bisects the quantity axis at that same level of output.

2.   A competitive firm can sell all the output it wants without having any impact on market price. For each additional unit sold its revenue will rise by the market price. Hence, MR is the same at all levels of output.

Each time a monopolist increases output by one unit, it must lower the price to sell it. The additional revenue the monopolist receives is actually less than the price because consumers who were already buying the output get a price break too. MR is, thus, lower than price, and as output increases, both price and MR decline.

3. (a   2000 price is P_1; output is Q_1.

(b $TR = P_2AQ_20; TC = CBQ_20;$ Total   profit   =

P_2ABC.

(c)   Point E is the perfectly competitive outcome; Point A is the monopoly outcome. Under monopoly, price is higher ($P_2 > P_1$) and output is lower ($Q_2 < Q_1$).

(d)   The memo should mention that under the monopoly, the price is higher and output lower than it was under perfect competition. Further, the price is higher than marginal cost. This is not efficient because some potential customers who are not buying actually place more value on additional units of the good than it would cost to produce them. Breaking up the monopoly into several small firms (its original competitive structure) would bring the price and quantity back to the efficient level, where $P = MC$.
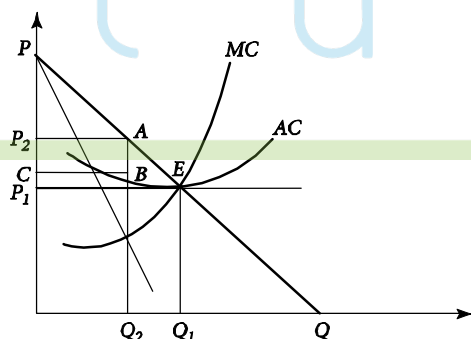
4.

Interval	Marginal Revenue
0–5	+90
5–10	+70
10–15	+50
15–20	+30
20–25	+10
25–30	−10
30–35	−30
35–40	−50

TR at 0 is zero; TR at 5 is 450; $450 \div 5 = 90$.

Produce as long as $MR > MC$; thus if $MC=\$20$, optimal output = 20 units.

Profits are $TR = \$12,000(20 \times \$60)$ minus $TC = \$100\ FC + 400\ VC(20 \times \$20) = \$500$

Thus, profit = \$700.

    When $MC = \$40$, optimal output = 15 units, $TR = \$1,050(15 \times \$70)$

      $TC = \$100\ FC + 600\ VC(15 \times \$40)$ And, finally, profit = \$350 (\$1,050 - \$700).

5.   a.   Optimal output q^*

     b.   Optimal price p^*

     c.   Total revenue $\overline{p^*Aq^*o}$

     d.   Total cost $\overline{CBq^*0}$

     e.   Total monopoly profits $\overline{p^*ABC}$

     f.   Total "excess burden" or "welfare costs" of the monopoly $\overline{ABD}$

    The cost to consumers from a higher price is greater than the gain in profit for the monopolist.
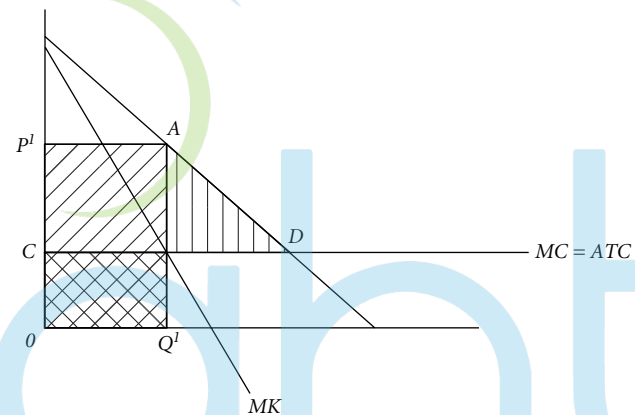
6. (a) $Q^* = 10,000$ (b) $P^* = \$4$

   (c) $TR = \$4 \times 10,000 = \$40,000$ (d) $TC = ATC \times Q = \$5 \times 10,000 = \$50,000$

   (e)   profit = $TR - TC = -\$10,000$ (a loss of \$10,000)

7. (a, b)
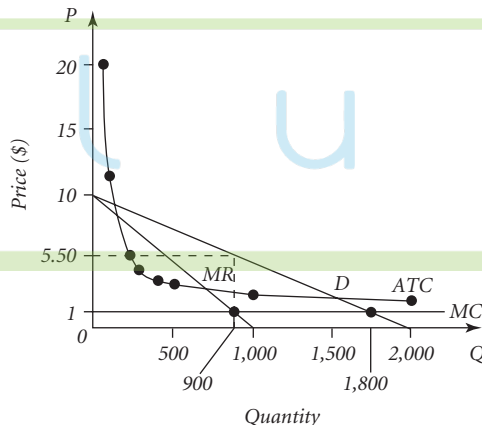
   (c)   Profit-maximizing output is 900; profit-maximizing price is \$5.50.

   (d)   Efficient price would be \$1, where the demand curve intersects the marginal cost curve. At this price, $Q = 1,800$.

   (e)   Long-run output would be zero, because losses would cause the monopoly to exit the industry.

   (f)   Alternatively, regulators could require the monopoly to charge a price equal to marginal cost and then subsidize the monopoly's loss.

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(f) Alternatively, regulators could require the monopoly to charge a price equal to marginal cost and then subsidize the monopoly's loss.

8.

Total Profit $= P_T^2 \ \overline{\text{ABCDEF}}$
$P_T^1 =$ Initial price in Taiwan
$q_T^1 =$ Initial quantity in Taiwan
$P_T^2 =$ Price in Taiwan after
          U.S. Market Opens
$q_T^2 =$ Quantity in Taiwan
$q_{TOTAL}^T - q_T^2 =$ Quantity sold in U.S.
$Pus =$ Price in U.S.
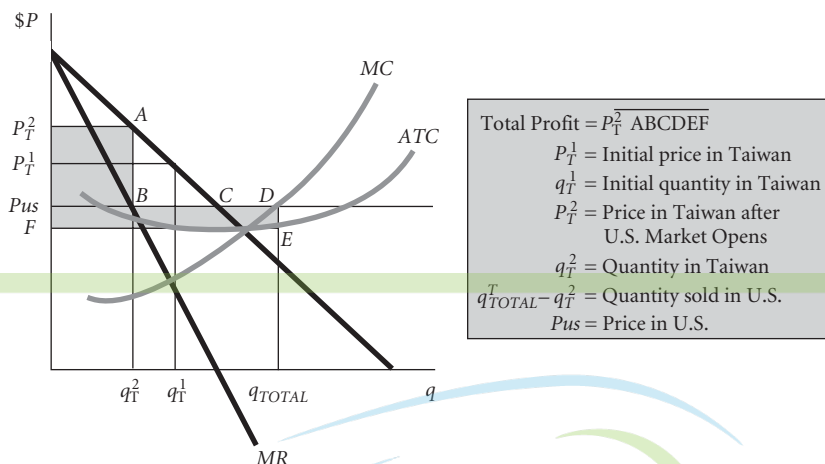
9.   Answers will vary.

CHAPTER 14

1. (a) and (d) are probably oligopolies dominated by a few firms: (b), (c), and (e) are clearly monopolistically competitive because there is lots of product differentiation, many firms, and lots of entry and exit.

2. (a) Disagree. There are no barriers to entry in monopolistic competition, and economic profits are eliminated in the long run.
    (b) Disagree. Oligopoly is an industry in which there are some firms that can control price or influence price because of their size. Dominant firm price leadership is an oligopoly model.
    (c) Disagree. Price does not equal MC in the short or long run in monopolistically competitive industries.

3. Bands are an example of monopolistic competition. Firms are small and have some, but not much market power. Better bands are more expensive than lesser-known bands. The average local band is not likely to be earning economic profit. Clearly there is product differentiation as each group tries to attract fans and CD buyers.

    Bands advertise and try to improve. Booking agents often serve as barriers to the entry of new bands.

4. (a) A good example was AT&T when it held a dominant position in the U.S. telecommunications market. At the same time it had little competition in the United States, other countries had big, powerful telecommunications firms producing equipment (telephones, etc.) and services for the world market. World competition was fierce.
    (b) The key is the availability of substitutes. A monopoly is a firm producing a product for which there is no close substitute. When they were just another band, clubs could hire a cheap band and consumers didn't know the difference or care. With their success, there became fewer substitutes in the minds of consumers.

5. (a-d) Shipbuilding and wine production: not contestable. Both require large investments of land and capital that cannot easily be moved to another location or another industry. Trucking is contestable because it's easy to move trucks to new locations. Housecleaning services are contestable because it requires a very small initial investment.

6. Both A's and B's potential losses are minimized by cheating. To minimize the maximum loss, A should cheat because it yields higher profit regardless of what B does. The same is true for B. If A cheats, so will B, and if B cheats, so will A. Most likely outcome: Both will cheat.

7.
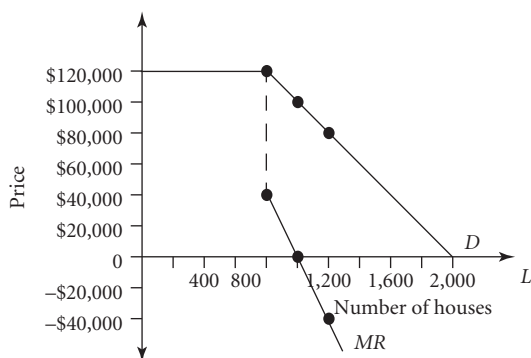
(a-c) With either $MC = \$100{,}000$ or $MC = \$85{,}000$, 800 homes will maximize profits, and a price of $\$120{,}000$ will be charged.

8. (a) 30 units. (b) $P=\$14$.
   (c) $TR = 30 \times \$14 = \$420$.
   $TC = \$9 \times 30 = \$270$.
   Profit $= \$420 - \$270 = \$150$.
   (d) In the long run, entry will shift the demand and marginal revenue curves left until normal profit is earned at the profit-maximizing output level. This occurs when the demand curve is tangent to the ATC curve.

9. (a) Both have dominant strategies in Game 1—charge the low price. Neither has a dominant strategy in Game 2.
   (b) You might try tit for tat (match the competitor's move) to signal the opposite that if she prices high, you will also do so.
   (c) If you are risk averse, you would probably swerve to guarantee a gain of 3. This minimizes your losses from the worst thing that can happen to you (a maximin strategy).

CHAPTER 15

1. The statement is correct. Figure 14.3 in the text shows that when the penalty is equal to the marginal damage cost, the price paid by consumers will increase until it equals marginal social costs. A tax in excess of marginal damage cost will cause price to exceed marginal social cost—an inefficient result.

2. The automobile causes a number of externalities including pollution and congestion. Many advocate tolls as a way to force drivers to weigh these external costs in their decision to drive.

3. Answers will vary depending on where you are from. In general, land exists at a location, and land use affects anyone who lives or does business near that land. These are sometimes called neighborhood effects. The externalities from sprawling development include congestion, air pollution, loss of open space, and a change in the character of life for current residents. Home buyers, developers, commuters, businesses investing in new factories, warehouses or office buildings all make decisions that are likely to impose costs on society. Many public policy approaches exist: tolls for commuters, parking regulation, expensive fees for developers who need new sewer and water services, and city purchases of open space all have been used by government to force decision makers to consider the harms that they impose. Oregon imposed an "urban growth boundary," limiting development to an area within a specific distance from downtown Portland. Unfortunately, sprawl exists because many people want to live in the suburbs and have some land. Measurement of externalities is clearly a problem, but the externalities clearly exist and ignoring them may lead to a large misallocation of resources across space.

4. Because of the free-rider problem and the drop-in-the-bucket problem, which exist because public goods are non-excludable and non-rival, private producers will find that voluntary contribution to produce public goods will not work. Another argument is that individuals face a prisoner's dilemma in deciding whether to contribute to the production of public goods or not (see last chapter). Thus, we get together and decide what we need to do collectively to procure what we want, we form a government that acts with power to produce what we collectively want, and we make contribution mandatory by collecting a tax.
   (a) With private goods, we each get to choose what quantity of each good we want. If I don't like a good, I don't buy it. But with public goods, we all get the same level of output. We all breathe better air if it is cleaned up, and we all get the same amount of national defense. When public goods are produced locally we have more choice (see discussion of the Tiebout hypothesis).
   (b) Representative democracy is not guaranteed to produce the socially optimal mix of public goods. Some problems are logrolling, a poorly informed electorate, poor incentives for people to become informed and

vote, and the fact that votes are limited to *bundles* of public goods. Also, Arrow's theorem implies that there is no consistent, nonarbitrary way to agree on what the socially optimal mix is. The voting paradox is an example of why majority voting does not provide a consistent social choice mechanism.

(c) An example might be a bureaucrat who is motivated just to increase the power, prestige, and budget of her bureau. This might lead to bloated bureaucracies. Clearly there has been great pressure in recent years to keep politicians and bureaucrats honest. The press plays an enormous role.

5. (a) *Elementary and secondary education*: Private aspects—substantial benefits accrue to the individual, and those who do not pay could, in theory, be excluded from receiving them. Also there is rivalry, in that there is a limited number of students one teacher can effectively teach. Public aspects—there are substantial benefits to the public at large (more informed voting, more socialized behavior). It is impossible to limit these benefits to those who pay.

(b) *Higher education*: Same as in (a), but here even more of the benefits accrue to the individual, and the costs are often borne by those who benefit.

(c) *Medical care*: Private aspects—most of the benefits of good health are enjoyed by the individual, and in theory we could exclude those who won't or can't pay. Also, there is high degree of rivalry. Public aspects—substantial public benefits when communicable diseases are reduced or public health is improved.

(d) *Air-traffic control*: Private aspects—there is certainly rivalry, as shown by the congested skies over urban airports and the ulcers suffered by overworked air-traffic controllers. Public aspects—all air traffic in a given area must be controlled from a single set of controllers. Competing firms would not be able to supply this service effectively. Also, there are substantial benefits to the public at large, which are nonexcludable (e.g., reduced probability of a plane crashing into one's home).

6. (a) This might work in the small numbers case, but here, large numbers of people are involved, and the free rider problem and the drop in the bucket problem are likely to get in the way of the efficient outcome.

(b) Compensation may be fair, but there are some worries about efficiency. First is Coase's contention that compensation might interfere with the damaged party's incentive to avoid the damage. Compensation for past damages will also overcharge the polluter and potentially put him out of business. For efficiency, the charge must be equal to "marginal damage cost."

(c) This works perfectly in the case where the damages are very high. For example, suppose that the factory was dumping highly radioactive waste! But if the pollution damage was small relative to the benefits of production on the current site, it is inefficient to stop it cold. Also, there may be ways of reducing certain effluents if the tax were set correctly.

(d) This one is efficient assuming that the marginal damages can be measured accurately. You might argue that it is not equitable, but by not compensating the damaged parties, they still have the incentive to avoid the damage if it is the least expensive way of dealing with the problem.

7. (a) People disagree about this. There are private aspects of housing for the poor: excludability and rivalry. There may also be substantial benefits for society at large when everyone has a place to sleep at night.

(b) Disagree. An unregulated market economy tends to *under*produce public goods, because nonexcludability and the free-rider problem prevent the private sector from charging for these goods.

8. Rewrite the demand curves as:
$P_X^A = 5 - .05Q_X^A$ and $P_X^B = 10 - .1Q_X^B$.
Since X is a public good, $Q_X^A = Q_X^B = Q_X$.
Summing vertically, $P_X = P_X^A + P_X^B = 5 - .05Q_X$ $+10 - .1Q_X = 15 - .15Q_X$. Setting price equal to marginal cost yields $6 - 15 = .15Q_X$ and $Q_X = 60$. Plugging $Q_X = 60$ into each demand equation we find that A should be charged \$2 per unit and B should be charged \$4 per unit.
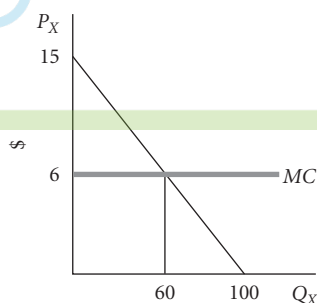
9. Most economists would argue that the patent system is, on balance, a good thing. True, patent holders—as monopolies—charge a higher-than-efficient price for the technology. But without such monopolies, the new technologies would not have been developed in the first place. Still, government involvement in research may be justified on several grounds. It might be better to have the government fund the research and make the results widely available than to encourage research via patents that impart monopoly control over new ideas. Also,

patents may not be sufficient to keep new technology from being imitated once developed. In this case, the private sector has little incentive to develop the new technology.

10. False. First, the statement ignores the difficulty of negotiations when large numbers of individuals are involved. Second, externalities involve equity as well as efficiency problems. (Examples used will vary.)

11. (a) *Imperfect information*: impossible to verify who is faking. Also, moral hazard: less reason to avoid injury due to benefits received.
    (b) *Adverse selection*: disproportionate number of damaged computers will be sold.
    (c) *Imperfect information*: difficult to know how well a company's system will work until after it is in place. Hard to evaluate competing bids.
    (d) *Adverse selection*: The worst drivers will buy more insurance, forcing up rates and causing better drivers to choose between subsidizing bad drivers or doing without insurance. Also, moral hazard: less reason to avoid collisions if insurance company will bear the costs.

12. Answers will vary, but should mention public goods, externalities and imperfect market structure at a minimum. Could bring in "public choice" as an issue.

CHAPTER 16

1. If we assume that most people work a 40 hour week and 52 weeks per year, at $5.15 an hour, someone would earn $10,712.00 a year, or $892.67 per month. Less taxes, if the tax rate is 10%, that means a "take-home" amount of $803.40 a month. Other parts of the answer (like the cost of rent) will vary based on location. Hypothetical budgets should allow for utilities, clothes, and other necessities.

2. Many approaches are possible. Certainly, the change would be to help the very top of the income distribution. There is entitlement theory that says we are entitled to the fruits of our efforts. Wealth is accumulated by saving. Since income has been taxed, this is a double hit on what a household has saved. It also discourages saving and investment and could reduce capital accumulation and slow growth. On the other hand, utilitarian theory argues that taxing high-income households results in a smaller sacrifice since the marginal utility of income is low to a rich family. The social contract theory of Rawls also can be used to support the tax.

3. The Gini coefficient for African-Americans exceeds that for whites. The Gini coefficient for 1995 exceeds that for 1980. A higher Gini coefficient is one possible signal of greater income inequality. Note that the differences in the Gini coefficients are uninformative as to differences in the average income of the two groups.
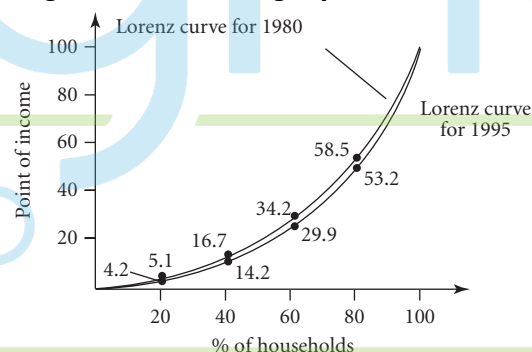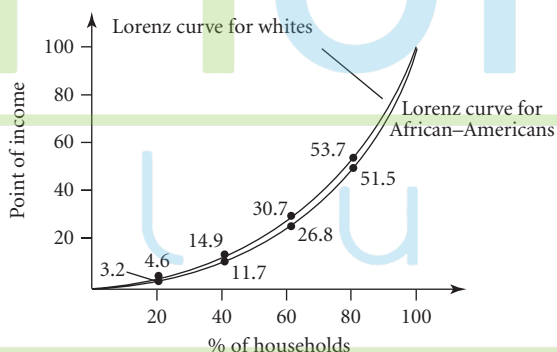
4. The biggest reason was that the economy was expanding at a rapid pace during this period. Millions of new jobs had to be filled; employment and labor force participation increased dramatically. In addition, welfare reform was passed and federal law made benefits temporary. In addition, real benefit levels have been falling steadily for years, making the opportunity cost of leisure significantly higher. In other words, the trade-off between work and welfare shifted toward work. The new welfare bill also provided more money for child care and medical insurance. There are many other possible explanations.

5. Capital is an input into the production process that is produced and produces benefits over time. Clearly education is produced, and it in turn is used to produce other things. The return comes to educated people in the form of higher wages and benefits as well as higher utility from job satisfaction. Parents may enjoy psychic rewards if their children are successful as well. You would need to calculate the full costs of the education including the opportunity cost—forgone wages during time spent in school. The money returns can be estimated by looking at wages paid in

various professionals and job categories. College-educated workers earn *much* higher wages than those without a college degree.

6. Computer programming requires a great deal of skill and training. Those who get such jobs have a lot of human capital. Working in a gas station or a car wash does not require great skill. Logging and heavy construction require some skills and are dangerous occupations requiring employers to pay compensation differentials to attract workers.

7. Answers will vary.

8. Disagree. The statement ignores different working conditions, differing vacations, and differing time available for other income opportunities (writing books, consulting). Also choices reveal preferences for various jobs. Academic jobs must yield more utility to some or no one would be an academic.

9. Answers will vary. Cost-of-living differences would imply that they should be different. The concept of "horizontal equity" (equal treatment of equals), would argue for similar benefits after adjusting for cost-of-living differences. On the other hand, it may well be true that people tend to move to higher-benefit areas and away from low-benefit areas. This could result in concentrations of poverty, such as in the urban north. There is mixed evidence on the last point.

10. Social security, Medicare, private pensions, and the availability of secure vehicles for saving (like FDIC-protected bank accounts) have all contributed to the reduction of poverty among the elderly.

11. If labor markets work the way the competitive ideal suggests, pay is linked to productivity. Recall that the demand for labor reflects the marginal productivity of workers in each market. A worker in one labor market is paid more than workers in another because the value of his/her product is greater there. Wages reflect the relative scarcity of various skills as well. Differentials provide incentives for people to invest in the kinds of human capital that are needed.

On the other hand, discrimination by race or gender may crowd certain occupations or result in patterns of inequality that cannot be explained by productivity alone.

CHAPTER 17

1. See the arguments from the chapter that favor consumption taxation or income taxation (see "best base" discussion). Income tax is a double tax on savings. Taxing consumption taxes what we "remove from the common pot," not what we leave in. Taxing consumption encourages saving, which creates capital. For retaining an income tax, one could argue that income is a better measure of "ability to pay". A VAT or a national sales tax would be regressive, but one could design more progressive consumption taxes.

2.
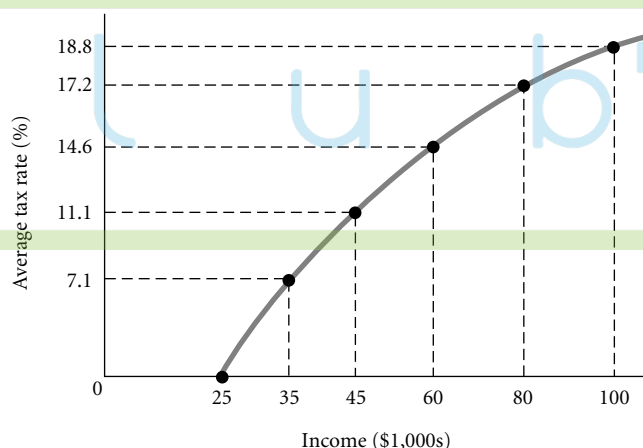
The tax is progressive because the first $25,000 is taxed at a marginal rate of zero. As income rises, the part subject to the 0% rate shrinks as a percentage of total income and the part subject to the 25% marginal rate rises as a percentage of total income.

3.

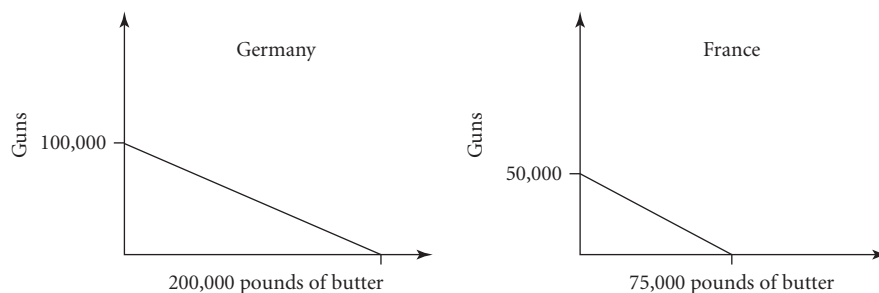| Total	Income	Taxable Income	Tax	Marginal Rate	Average Rates
a	35,000	26,800	3655	15%	20.4%
b	50,000	27,200	3350	15%	6.7%
c	90,000	81,800	17,410.50	28%	19.3%
d	110,000	87,200	15,130	25%	13.7%

assumes standard deduction 2005 = 5000 single taxpayer
personal exemption $3200
10,000 married filing jointly

4. Answers will vary.

5. Taxes are ultimately paid by households. The corporate tax falls most heavily on owners of capital. The proposed change would shift the tax burden from labor to capital, which might improve income distribution but might also reduce the rate of capital accumulation.

6. Disagree. Excess burdens come about because of distortions in behavior. If a good has a low demand elasticity, the tax will have a relatively small effect on quantity demanded, and the excess burden will be relatively small.

7. (a) Disagree. The labor supply elasticity for most of the work force is close to zero. Therefore, the drop in the payroll tax, which increases the net wage, is unlikely to cause a significant increase in labor supply.
    (b) Disagree. Monopolies cannot pass any tax on profits on to consumers. The profit maximizing price and quantity remain unaffected by the tax. If you tax 35% of profit, the firm still maximise profit.
    (c) Disagree. First, some non-neutral taxes correct for pre-existing externalities. Second, equity consideration may make a non-neutral tax desirable, even though it results in an excess burden.

8. If one thinks of the social security tax as payment for future entitlements, it would be correct to list it as part of employee compensation. However, Congress could always change the law so that those "entitlements" aren't received, and faculty may prefer to receive cash rather than future benefits; to this extent, the full value of the payroll tax should not be counted as compensation. Also, it must be pointed out that the imposition of the tax does not raise overall employee compensation. If it really is just another form of compensation, wages will simply fall by the amount of the tax. To the extent that it is a tax because workers prefer to be compensated in a different way, if the supply of labor is inelastic workers will bear the burden of the tax and their compensation will be reduced.

9. Individual commodities have a larger elasticity of demand than broad groups of commodities or consumption goods as a whole. The greater the elasticity, the more distorting the tax. In addition, developing countries are usually commodity-exporting countries. The taxes would make their exports less competitive and harm domestic export industries.

10. If the cost of one's car is proportional to one's income, then the tax would be proportional. If high-income people spend a smaller (larger) percentage of their income on cars, then the tax would be regressive (progressive). The tax would distort by discouraging automotive ownership (especially ownership of expensive cars) but might also correct for existing externalities (congestion, air pollution, noise).

11. Use Figure 17.7 as a guide: the excess burden is the area of the triangle ABC. The area of a triangle is ½ the base times the height. In this case, the height is .10 x $15 or $1.50 in tax T per unit. The base is 2 million (12 million minus 10 million). The area (excess burden) is thus $1.5 million. Total tax collected is $1.50 x 10 million = $15 million. The excess burden is 10% of the tax collected.

CHAPTER 18

1. (a

Germany

Guns

100,000 —

200,000 pounds of butter

France

Guns

50,000 —

75,000 pounds of butter

(b) Yes. The opportunity cost of a gun in Germany is 2 pounds of butter. The opportunity cost of a gun in France is only 1.5 pounds of butter. France has a comparative advantage in guns. Similarly, the opportunity cost of a pound of butter in Germany is 1/2 of a gun, whereas the opportunity cost of a pound of butter in France is 2/3 of a gun. Germany has a comparative advantage in the production of butter.

(c) As long as the agreement specifies between 1.5 pounds of butter and 2 pounds of butter per gun, specialization and trade will benefit both countries. For example, an agreement to exchange 1.75 pounds of butter per gun would benefit both countries.

2. Answers will vary.

3. (a) You cannot tell from the information given which country has an absolute advantage because you are not given any information that would indicate the actual quantities of inputs used in production in either country.

(b) If resources are fully mobile between sectors, the opportunity cost of a cap is 2/3 of a bushel of wheat in Russia; the opportunity cost of a cap is 7/10 of a bushel of wheat in the United States. Russia has a comparative advantage in cap production. The opportunity cost of a bushel of wheat in Russia is 1.5 caps. The opportunity cost of a bushel of wheat in the United States is 10/7 or 1.43 caps. The United States has a comparative advantage in wheat.

(c) At $1 = 1 Ru, both goods in the United States are cheaper to everyone. That would mean that there was a big demand for dollars and no supply on foreign exchange markets. The price of the dollar would rise. When a dollar was valued at between 1.43 and 1.50 Ru, caps would be cheaper in Russia and wheat would be cheaper in the United States. If the price of a dollar rises to more than 1.50 Ru, everyone would buy both goods in Russia.

4. Clearly, clothing is produced with cheap labor, and we buy most of our clothing from abroad because of the relatively high cost of labor in the United States. Airplanes are produced on the other hand with highly skilled workers, and the United States does enjoy a comparative advantage there. The United States does not have as large an endowment of oil reserves as the rest of the world, yet we are a big consumer. Both vehicles and agricultural goods are very heterogeneous. Automobiles lend themselves to "acquired comparative advantage." While the United States has a lot of very fertile land for crop production, many things that we consume are not suited for production: coffee, tea, dates, tropical fruits (like bananas), and so forth. The table demonstrates the enormous complexity of the pattern of international trade.

5. (a) Illinois would have an absolute advantage in both wheat and soybeans.

(b) In Illinois, taking 1 acre out of wheat and moving it into soybeans sacrifices 48 bushels of wheat for 39 bushes of soybeans. This is $48/39 = 1.23$ bushels of wheat for each bushel of soybeans. In Kansas, the sacrifice is $40/24 = 1.67$ bushels of wheat for each bushel of soybeans.

(c) Based on the calculations in (b) above, Kansas has a comparative advantage in wheat, and Illinois has a comparative advantage in soybeans.

(d) Yes, the data are consistent with the conclusions in (c) above. Kansas has more acreage devoted to wheat than soybeans, whereas in Illinois there is more acreage devoted to soybeans than to wheat. Although neither state completely "specializes," each state seems to be devoting more of its resources to producing the good in which it has a comparative advantage.

6. Answers will vary.

7. (a) The opportunity cost of a bottle of red wine is 1.5 bottles of white in the U.S. and 2 bottles of white in Australia. The U.S., therefore, has a comparative advantage in red wine. The opportunity cost of a bottle of white wine is .66 bottles of red in the U.S. and .5 bottles of red in Australia. Australia, therefore, has a comparative advantage in white wine.

    (b) No. At the current exchange rate, both white and red wine are cheaper in Australia. U.S. citizens will want to import both types of wine from Australia, but Australians will not want to import U.S. wine.

    (c) In this situation, we would expect the price of the dollar to decrease until U.S. red wine became attractive to Australians whereas Australian white wine is still attractive to Americans. (An exchange rate between 1.5 and 2 U.S. dollars to one Australian dollar would accomplish this.)

    (d) In the long run, we would expect exchange rates to adjust until Americans are exporting red wine to Australia and Australians are exporting white wine to the U.S.

CHAPTER 19

1. Answers will vary.

2. Answers will vary.

3. Answers will vary.

4. If the Chinese economy is running a huge trade surplus, you would think that there would be a big surplus of dollars on the market and that the value of the dollar against the Chinese currency would fall. But the Chinese are using the dollars paid for their goods to buy dollar-denominated assets: Government bonds, U.S. companies, etc. While this maintains a balance of payments equilibrium for a while, there is much debate about how long it can go on.

5. Public goods, sometimes called social goods, are goods or services that bestow collective benefits on members of society. Generally, no one can be excluded from enjoying the benefits of public goods once they are produced. Classic examples are clean air and national defense.

Stopping the AIDS pandemic would provide numerous public benefits, not the least of which is a lower probability of being infected. In addition, the United States would save millions in aid, and increase the productivity of parts of the world that are not producing enough to grow.

Private goods such as hamburgers are produced by the private sector because a firm can exclude those who don't pay. If exclusion is impossible, two problems arise for markets: the "free rider problem" and the "drop in the bucket problem." The free rider problem refers to the individual incentive not to pay for a good since everyone benefit regardless of who pays. The drop in the bucket problem refers to the individual incentive not to pay because each individual contribution is so small as not to matter. As a result, the private sector is powerless because it is in peoples' interest to not pay, and it falls to government to provide public goods. This is compounded when governments of many nations are involved.

CHAPTER 20

1. Answers will vary but should include the direct costs of health care, the loss of workforce, declining productivity, shortage of saving and capital investment, uncertainty, etc.

2. Answers will vary. There is no clearly "right answer" to this problem, only trade-offs. Capital accumulation requires saving (reduced consumption), and when most citizens are earning subsistence wages, reducing consumption is not an option for many.

3. (a) Capital increases the productivity of labor. A given-sized labor force can produce more output, and output per capita rises.

    (b) In a market economy, individual household saving decisions determine the pool of aggregate saving. Aggregate saving, in turn, is the amount made available for firms to purchase capital. Saving is matched to investment projects in financial markets, where the interest rate adjusts to equate total desired investment with total desired saving.

(c) In developing countries, a greater fraction of output is needed just to ensure the current population's survival. An increase in investment—which requires a decrease in current consumption—cuts dangerously close to this survival level of consumption, and at a minimum causes more discomfort than it would in developed countries.

(d) Answers will vary. Market-oriented economists would stress increased incentives for private investment (political stability, lower government budget deficit, and perhaps loans from abroad). Planning-oriented economists might stress government-directed projects, taxes on luxury goods, and capital controls designed to prevent capital flight to developed countries.

4. Answer will depend on events.

5. It is true that poor countries must accumulate capital in order to grow, but many poor countries do indeed have little or no extra output available for saving. One problem is that the available saving goes abroad (capital flight). Increased political stability and a more stable investment climate can help stimulate investment in the domestic economy. In addition, poor countries can get loans and other assistance from developed countries to help them accumulate capital.

6. Many recent famines have resulted from government policies. In some cases, keeping farm prices artificially low has led to a decrease in production. In other cases, a failure to invest in a distributional infrastructure has led to famine in outlying rural areas.

7. This situation changes daily. Among the interesting developments to watch are the development of a ruble zone among the former republics of the USSR and the continuing economic integration of Central Europe (Czech Republic, Poland, Slovakia, Slovenia) with Western Europe. One approach could be to contrast incremental reform (Hungary) with drastic reform (Poland). Another approach could be to contrast reform imposed by democratically elected officials (Czech Republic) with that imposed by more autocratic figures (Russia, Ukraine).

8. The speaker confuses political systems with economic systems. The Soviet economic system was one of socialism (government ownership of land and capital) and central planning (government direction of resource allocation). Totalitarianism is a political—not an economic—system in which the ruler exercises authoritarian control without the consent of those governed.

9. Socialism is an economic system in which the "means of production" (land and capital) are owned and controlled by government. The possible strengths: rapid growth from planned capital accumulation, internalization of external costs, and more fair distribution of income (because no property income).

10. There are arguments on both sides. Firms that acquire market power tend to overprice and underproduce relative to the efficient price and output levels. Market power, it is argued, stifles both price and quality competition. Microsoft was charged with anticompetitive behavior by packaging its Web browser with its dominant operating system, Windows. After knocking out the competition, they can raise prices without competitive pressure. But what about foreign competition? Isn't it a bigger, tougher game when the competition is a foreign firm receiving government support? The real problem is that the government is likely to be lousy at picking winners. What makes us think that the government can pick winners better than the market? Even recent Japanese attempts to subsidize a winner (fifth-generation computers) have failed.

11. In a capitalist economy, wages and profits are "market signals" that direct resources to where they produce the most economic value. Those with skills most in demand will receive higher rewards, even if they work no harder than others with less needed skills. The result is an efficient allocation of resources, but unequal rewards to the members of society. If efforts to reduce inequality rely on high tax rates on labor or capital income, there may be a tension between equality and efficiency.