(60%) Part I: Circle the correct answer on the table provided on page one

(Multiple choices, with 2 points for each correct answer and **-0.25** point penalty on each wrong answer)

1. The two solutions of the quadratic equation $2x^2 - 6x = 0$ are :

a) 3 and 0 b) 2 and 0 c) -3 and 0 d) -2 and 0

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2. The solution of the logarithmic equation $\ln(3x\text{-}5) = 0$ is

a)-3 b) -2 c) 2 d) 3

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3. The coordinates of the vertex of the parabola $y = x^2 + 8x$ are :

a) (-5, -16) b) (-4,-25) c) (-4, -16) d) (-5,-25)

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4. $\lim_{x \to 1} \frac{3x-2}{6x} =$

a) $\frac{-1}{6}$ b) $\frac{1}{6}$ c) $\frac{1}{5}$ d) $\frac{-1}{5}$

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5. The equation of the vertical line through (-2 , 3) is:

a) $x = -2$ b) $y = -2$ c) $x = 3$ d) $y = 3$

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6. The solution of the inequality $(x-2)(x^2+3) \geq 0$ is

a) $[3,+\infty)$ b) $(-\infty,-3) \cup (2,+\infty)$ c) $(-\infty,-2) \cup (3,+\infty)$ d) $[2,+\infty)$

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7. $\frac{a^2c^3}{b} \times \left(\frac{b^2c^{-1}}{a}\right)^2 =$

a) ca^3 b) b^2c^{-1} c) b^3c^{-5} d) cb^3

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8. Given the logarithmic equation $\log_z n = m$. The equivalent exponential equation is:

a) $n^m = z$ b) $z^m = n$. c) $m^z = n$ d) $z^n = m$

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9. Let $y = f(x) = \frac{2}{3}x - 5$ and $g(x) = \frac{3}{\sqrt{x}}$ then $f(g(4)) =$

a)-4 b)-2 c) -3 d) -5

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10. $\log_a 1 + \log_a 6 - \log_a 3 =$

a) $\log_a 3$ b) $\log_a \frac{1}{2}$ c) $\log_a 2$ d) $\log_a \frac{1}{3}$

11. $\lim_{x \to 0} \dfrac{-x^2+1}{2x^2-3x} =$

a) $\frac{1}{2}$ b) 0 c) ∞ d) $\frac{-1}{2}$

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12. $\lim_{x \to 0} \dfrac{5x-1}{x+2}$

a) $\frac{1}{2}$ b) 0 c) ∞ d) $\frac{-1}{2}$

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13. If $g(x) = 5^{-2x}$ and $f(x) = x^2 - 1$ then $g(0) - 2f(1) =$

a)2 b) 1 c) 0 d) -1

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14. Consider the system $\begin{cases} x - y = 2 \\ -x + 3y = -4 \end{cases}$ then the unique solution is:

a) $(1,-1)$ b) $(2,-1)$ c) $(-1,1)$ d) $(2,1)$

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15. The domain of definition of $f(x) = \dfrac{\sqrt{x^2-3x}}{x^2+1}$ is

a) $x \neq -1,\ x \neq 1$ b) $-3 \leq x < 3$ c) $x \leq 0, x \geq 3$ d) $0 \leq x \leq 3$

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16. The system $\begin{cases} 2x - y = 0 \\ x + y = -6 \\ x + 2y = 5 \end{cases}$ has

a) no solution b) a unique solution

c) infinitely many solutions d) exactly two solutions

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17. The solution set of the equation : $\dfrac{3x+2}{x^2+1} = 0$ is :

a) $\{3\}$ b) $\left\{\frac{-2}{3}\right\}$ c). $\{2\}$ d) $\left\{-\frac{3}{2}\right\}$

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18. Given $f(x,y,z) = 3e^x - y^2 - (\ln z + 2)^2$ then $f(0,-1,1) =$

a)-3 b) 3 c) -2 d) 2

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19. $\displaystyle\sum_{i=1}^{3} e^{\ln(i+1)} =$

a) 12 b)9 c) 11 d) 5

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20. Given $f(x) = \begin{cases} x+3 & \text{if} \quad x < 1 \\ 2x+1 & \text{if} \quad x \geq 1 \end{cases}$ then $\lim_{x \to 1^-} f(x) =$

a)2 b) 4 c) 3 d). 1

21. If $f(x) = x^2 - 1$, then $f(2a+1)$=

a) $3a^2(3a+2)$ b) $3a(3a+2)$ c) $4a^2(a+1)$ d) $4a(a+1)$

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22. $\frac{x^2+5x+6}{(x+3)(x+1)} \div \frac{x+2}{x^2-1} =$

a) $(x-2)$ b) $(x+2)$ c) $(x+1)$ d) $(x-1)$

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23. $\log_3 \sqrt{3^5} =$

a) $\frac{2}{5}$ b) $\frac{5}{2}$ c) $\frac{3}{2}$ d) $\frac{2}{3}$

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24. The value of a truck is estimated by the function: $V = f(t) = 45{,}000 - 3{,}000t$ where V equals the value stated in dollars and t equals the age of the truck expressed in years, then the value of the truck will be equal to zero after:

a) 15 years b) 16 years c) 22 years d) 12 years

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25. The y-intercept of the function $y = 2\ln(x^2+e) - e^{3x} + 5$ is

a) 5 b) 6 c) 8 d) 7

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26. A step of (3x3) Gaussian elimination method has produced the following array:

$\left(\begin{array}{ccc|c} 1 & 0 & 0 & 0 \\ 0 & 1 & -2 & 0 \end{array}\right)$, then the solution set is:

a) $\{(x_1, x_2, x_3) / x_1 = x_2 = x_3 = 0\}$ b) $\{(x_1, x_2, x_3) / x_1 = 0, x_2 = -2x_3, x_3 \in R\}$

c) $\{(x_1, x_2, x_3) / x_1 = 0, x_2 = 2x_3, x_3 \in R\}$ d) $\{(x_1, x_2, x_3) / x_1 = 0, x_3 = -2x_2, x_2 \in R\}$

If $f(x) = 3^x + 2$, then:

27. Domain f =

a) **R** b) $(2, +\infty)$ c) $(-2, +\infty)$ d) $(3, +\infty)$

28. Range f =

a) $(3, +\infty)$ b) $(2, +\infty)$ c) $(-2, +\infty)$ d) **R**

29. The equation of the asymptote is:

a) $y = 2$ b) $y = 3$ c) $y = -3$ d) $y = -2$

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30. The profit function for a firm is: $P(q) = -10q^2 + 3600q - 45000$
Where q equals the number of units sold and P equals annual profit in dollars.
If 150 units were sold then the profit expected is equal to:

a) \$ 207 000 b) \$ 249 000 c) \$ 239 000 d) \$ 270 000

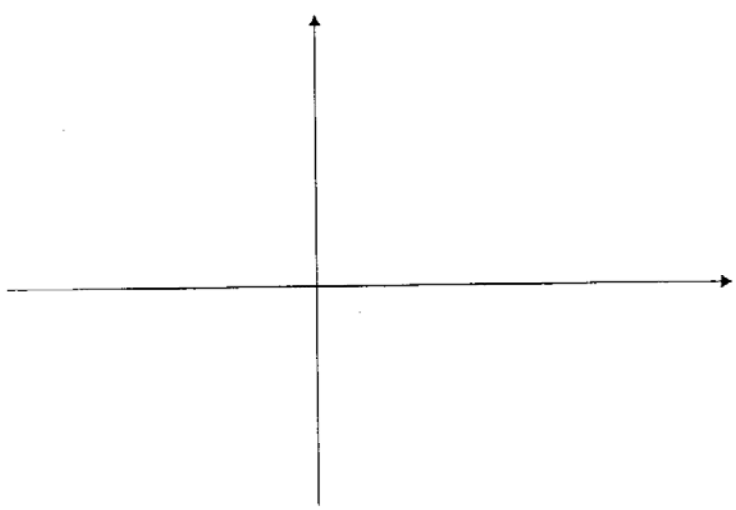
(40%)Part II (Answer each of the following questions in the space provided. Justify and show your work)

1) Given $\left(\begin{array}{ccc|c} 1 & 0 & -7 & -20 \\ 0 & -2 & -12 & 18 \\ 0 & 0 & 5 & 15 \end{array}\right)$, complete the remaining steps of the Gaussian method and determine the solution (x_1, x_2, x_3).

(8%)

2) Sketch function $f(x) = \begin{cases} x+2 & \text{if } x \le 0 \\ 2^x & \text{if } x > 0 \end{cases}$

(4%)



3) Solve the following equations:

a) $x^2 \ln x - 9 \ln x = 0$

(3%)

b) $\left(e^{2x} - 4\right)\left(e^x - 1\right) = 0$

(3%)

c) $|2x + 3| = x - 4$

(3%)

4) For each of the following find the limit (if it exists):

a- $\lim_{x \to 3} \frac{x-3}{x+1} =$

(2%)

b- $\lim_{x \to 2} \frac{x^2 + 5x - 14}{x^2 - 4}$

(3%)

c- $f(x)=\begin{cases}\dfrac{x^2}{x^2+2x} & if\, x\le 1\ \ , x\ne 0\\ \dfrac{2-x}{3} & if\, x>1\end{cases}$

$\lim_{x\to 1^-} f(x)=$

(3%)

$\lim_{x\to 1^+} f(x)=$

$\lim_{x\to 1} f(x)=$

Is $f(x)$ continuous at $x=1$? Justify your answer.

(3%)

5) For each of the following functions determine the derivative of $y=f(x)$ using the rules of differentiation.
(Don't simplify your answer):

a) $y=3x^2-5$

(2%)

b) $y=(x^3-2x)e^x$

(3%)

c) $y=\dfrac{\ln x}{x^4}$

(3%)