AMERICAN UNIVERSITY OF BEIRUT

Mathematics Department

Math 101 – Final Exam

Fall 2010 – 2011

Name:……………………………………….   **ID:**………………………………….

Please circle your section number:

Section 1   **Section 2**   **Section 3**   **Section 4**

F @ 9:00   **F @ 10:00**   **F @ 11:00**   **F @ 12:00**

Instructions:

1. Write your **NAME** and **AUB ID** number above.
2. Solve the problems on the white sheets at the appropriate place.
3. You may use the blank and the back pages of the white sheet to solve or complete the solution of a problem.

I -		/18
I I -		/5
I I I -		/5
I V -		/5
V -		/15
V I -		/17
V I I -		/20
V I I I -		/15
Total		/100

I- (18 pts) Evaluate the following integrals:

a- $\int \frac{x^2}{\sqrt{x^3-1}} dx$

b- $\int \frac{1}{t^2} \sin\left(\frac{1}{t} - 1\right) dt$

c- $\int \sec^7 x \tan x \, dx$

d- $\int_0^1 \sqrt{t^5 + 2t} \, (5t^4 + 2) dt$

e- $\int \frac{2x^3 - x^2 \cos 3x}{x^2} \, dx$

f- $\int_0^{\frac{\pi}{2}} \cos^2(\sin x) \cos x \, dx$

II- (5 pts) For what values of a and b is $f(x) = \begin{cases} ax + 2b & , \quad x \le 0 \\ x^2 + 3a - b & , 0 < x \le 2 \\ 3x - 5 & , \quad x > 2 \end{cases}$

continuous at every x?

III- (5 pts) Let $f(x) = \sqrt{\dfrac{8x^2+2}{2x^2+x}}$

a- Find the domain of f.

b- Find the asymptotes.

IV- (5 pts) Let $f(x) = \dfrac{x}{x-2}$, $(3,3)$

a- Find the slope of the function's graph at the given point.

b- Find an equation for the line tangent to the graph there.

V-   (15 pts) Let $f(x) = x^3 - 3x + 3$

a- Find the critical points.

b- Find the intervals where f is increasing or decreasing.

c- Find inflection point.

d- Find the interval where f concave up or concave down.

e- Find the local minimum and local maximum of f.

f- Does f has any absolute extremes?

VI- (17 pts) Find the derivative of the following functions:

a- $y = \left(1 - \frac{x}{7}\right)^{-7}$

b- $x^4 + \sin y = x^3 y^2$, (Hint: use implicit differentiation)
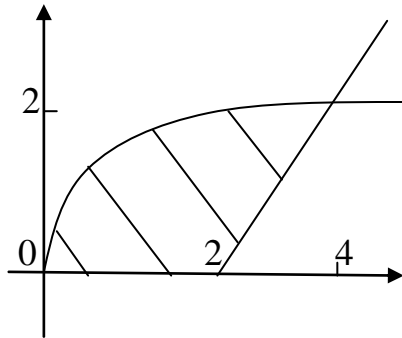
c- $y = (2 - x)\tan^2 x$

d- $y = \int_0^x \sqrt{1 + t^2} \, dt$

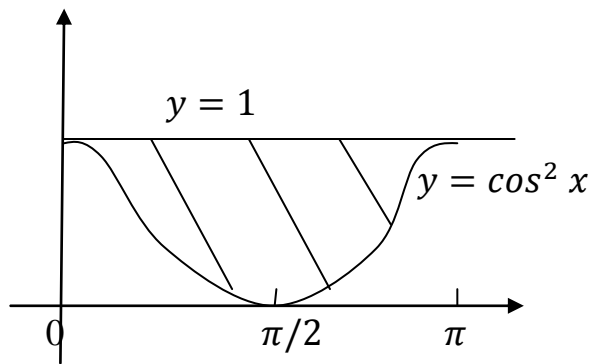e- $y = \int_1^{3x} \cos t \, dt + x^2$

VII- (20 pts)

    a- Find the length of the curve $y = (x)^{3/2}$ from $x = 0$ to $x = 8$.

    b- Find the area of the region in the first quadrant that is bounded above by $y = \sqrt{x}$ and below by the x −axis and the line $y = x - 2$.
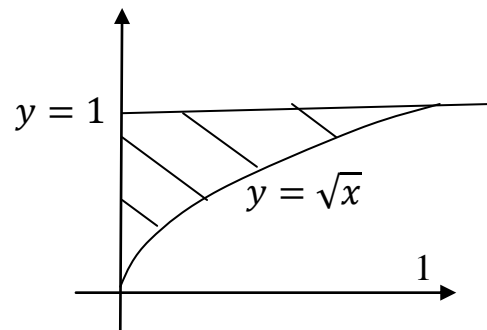
c- Find the total area between the curve $y = -x^2 - 2x$ and the x-axis, $-3 \le x \le 2$. (Hint: Find zeros of ...)

d- Find the area of the shaded region.

$y = 1$

$y = cos^2 x$

$\pi/2$ π

VIII- (15 pts) Find the volume of the solid generated by revolving the shaded
region about

a- x-axis

$y = 1$

$y = \sqrt{x}$

1

b- y-axis

c- $y = 1$

d- $x = 1$

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