Prince Sultan University

Math 113
Major Exam 1
Second Semester, Term 142
Saturday, March 7, 2015

Time Allowed: 90 minutes

Student Name:_____   _____   _____

Student ID #: _____

Serial Class #:_____   Section #:

Instructor's Name: Dr. Aiman Mukheimer, Dr. Bahaaeldin Abdalla, Dr. Saleem

Important Instructions:

1. You may use a scientific calculator that does not have programming or graphing capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. Talking during the examination is NOT allowed.
5. Your exam will be taken immediately if your mobile phone is seen or heard.
6. Looking around or making an attempt to cheat will result in your exam being cancelled.
7. This examination has **10** problems, some with several parts. Make sure your paper has all these problems.

Problems	Max points	Student's Points
1,2,3	21	
4,5	18	
6,7	15	
8,9,10	26	
Total	80	

1. Let A be the area of the region that lies under the graph of $f(x) = e^{-x^2}$ between $x = 1$ and $x = 3$

    (a) (5 points) Find an expression for the area A, using right endpoints **(Note: Do not evaluate the limit).**

    (b) (4 points) Estimate the above area to four decimal places by taking the sample points to be midpoints using four subintervals ($n = 4$).

2. (6 points) Let $f(x) = \begin{cases} \dfrac{d}{dx}(\sin x^3) & 1 < x \le \pi \\ \dfrac{7}{1 + x^2} & -1 \le x \le 1 \end{cases}$. Find $\displaystyle\int_{-1}^{\pi} f(x)dx$.

3. (6 points) The acceleration $g(x) = \int_{4}^{x^2} x\sin(t)dt$

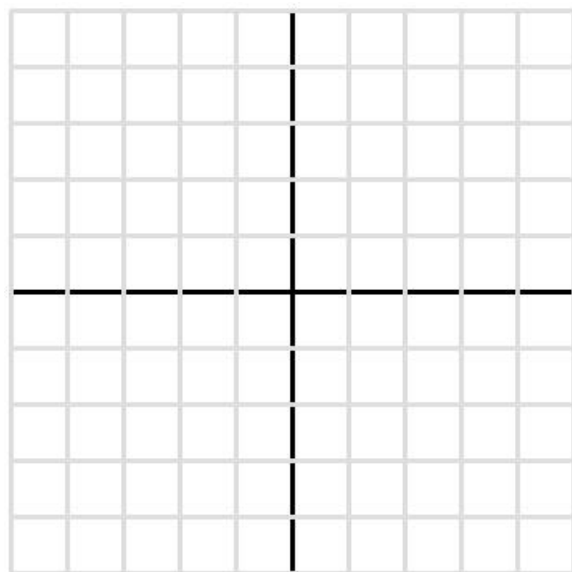4. Evaluate the following integrals: **(Show your work in details)**

i. (6 points) $\displaystyle\int_{1/2}^{\sqrt{3}/2} \frac{5}{(\sin^{-1} x)\sqrt{1-x^2}}\, dx$

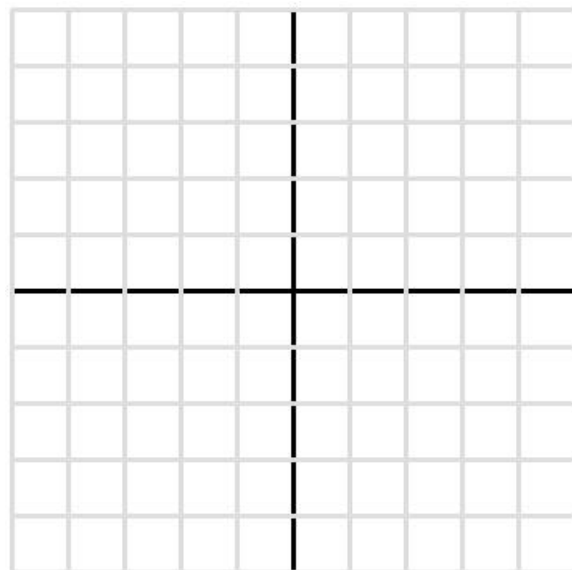ii. (3 points) $\displaystyle\int \frac{2t^5 + t^2 - 1}{\sqrt{t}}\, dt$

iii. (5 points) $\displaystyle\int_{-1}^{4} |3x - 6|\, dx$

5. (7 points) **Sketch** the region bounded by the curves below <u>and</u> **find** its area:

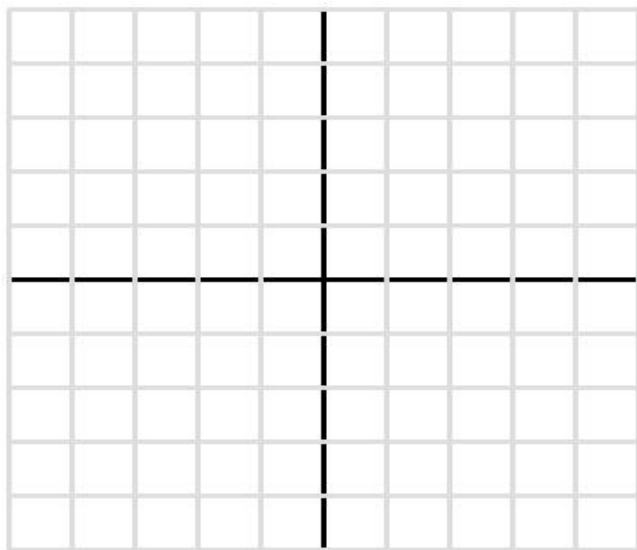$y = \cos x, \ y = -x + 2, \ x = 0, \ \text{and} \ x = \dfrac{\pi}{2}$.

6. (8 point) **Sketch** the region bounded by the curves below <u>and</u> **find** its area:
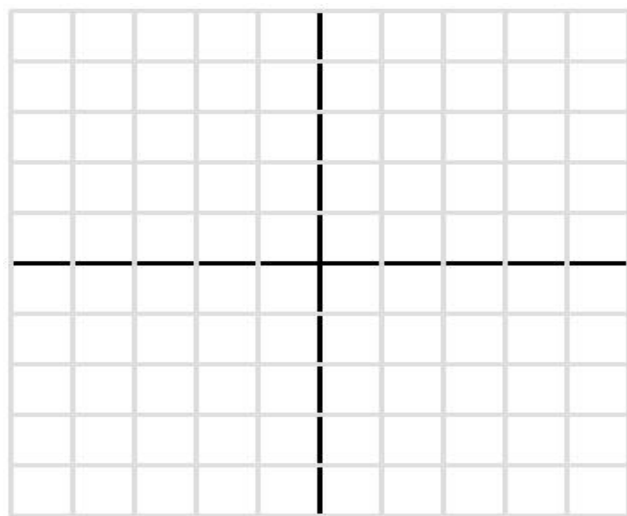
$y = \frac{1}{4}x, \ y = 2x^2, \ x + y = 3, \ x \geq 0.$

7. (12 point) **Sketch** the region **and setup only** a formula for the volume of the solid that we obtain by rotating the region bounded by $y = 4x - x^2$ and $y = 0$.

(a) About the line $x = -1$.

(b) About the line $y = 5$.

8. (8 point) **Sketch** the region **and** find the volume of the solid that we obtain by rotating the region bounded by $y = e^{-x}$, $y = 1$, and $x = 3$; about $y = -1$. (**Do not use the calculator**)

9. (6 points) Find the average value of $f(x) = x^2\sqrt{2+x}$ on the interval $[-2, 2]$.