



# Prince Sultan University

**Math 113**

**Major Exam 1**

**First Semester, Term 121**

**Monday, October 15, 2012**

**Time Allowed: 90 minutes**

Student Name: \_\_\_\_\_

Student ID #: \_\_\_\_\_

Serial Class #: \_\_\_\_\_

Instructor's Name: \_\_\_\_\_

## **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 12 problems, some with several parts. Make sure your paper has all these problems.

Problems	Max points	Student's Points
1,2	15	
3,4	17	
5,6,7	19	
8	20	
9,10	15	
11,12	14	
Total	100	

1. (8 points) Find a function  $f(x)$  satisfying the given conditions:

$$f''(x) = 20x^3 + 2e^{2x}, \quad f'(0) = -3, \quad f(0) = 2$$

2. (7 points) Evaluate  $\sum_{k=32}^{67} (k-3)(k+1)$

3. (9 points) Use a Riemann sum and a limit to compute the exact area under the curve of  $y = 2x^2 + 1$  on  $[1, 3]$ .

4. (8 points) Let  $f(x) = 3x^2 - 2x$ . Find a value of  $c$  that satisfies the conclusion of the Integral Mean Value Theorem over the interval  $[-1, 1]$ .

5. (9 points) Evaluate the integral  $\int_{-\sqrt{3}}^0 (3x + 4\sqrt{3-x^2}) dx$  (Note: use an appropriate formula from geometry if necessary).

6. (4 points) Find the derivative of:  $F(x) = \int_{x^2}^{x \ln x} \sin(t^2) dt$ .

7. (6 points) Let  $F(w) = \int_2^w f(x) dx$  where  $f(x) = \int_2^{x^2} \frac{\sqrt{16+t^2}}{t} dt$  Find  $F''(3)$

8. (20 points) Evaluate the following integrals:

i.  $\int_1^3 \frac{e^{\frac{3}{x}}}{x^2} dx$

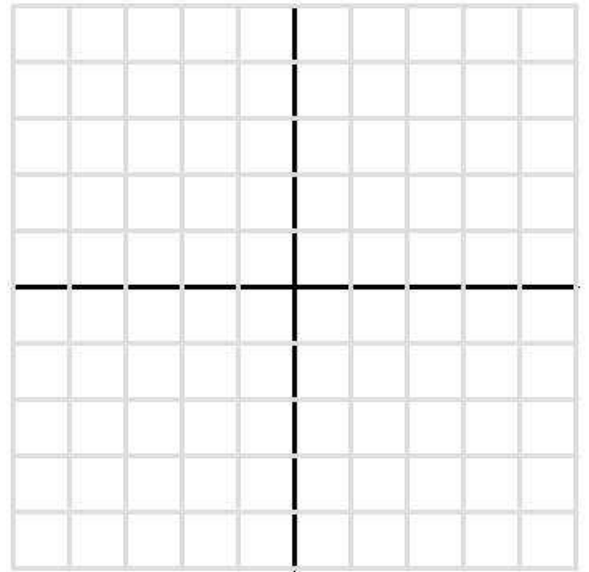
ii.  $\int \frac{x^5}{1+x^2} dx$

iii.  $\int \frac{1+x}{1-x^2} dx$

iv.  $\int_1^2 \frac{dx}{x^2 - 6x + 9}$

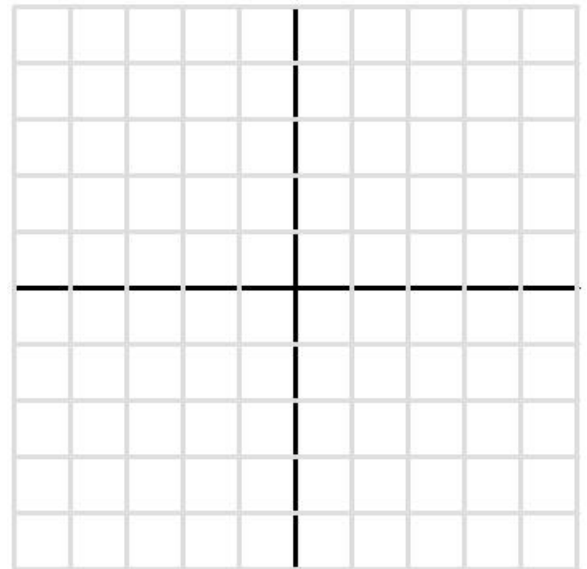
9. (7 points) Sketch the region bounded by the curves below and find its area:

$$y = x^2 - 1, \quad y = |x|, \quad x = -1 \quad \text{and} \quad x = 1.$$

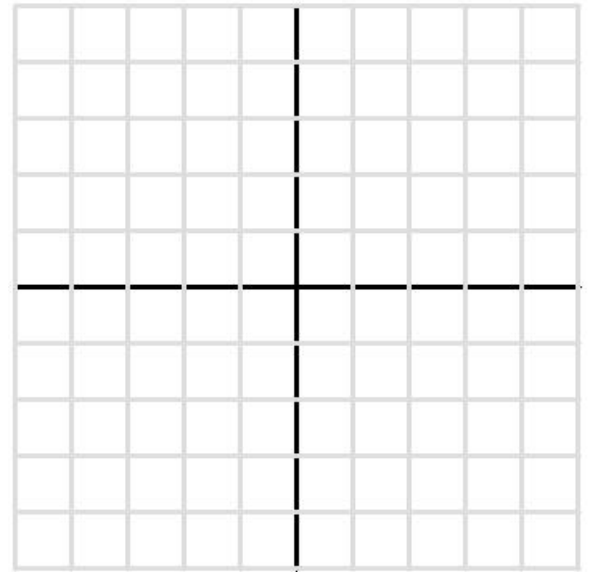


10.(8 point) Sketch the region bounded by the curves below and compute the volume of

the solid formed by revolving the region about  $y = 3$ :  $y = \frac{1}{x}$ ,  $x = 1$ ,  $x = 3$ ,  $y = 0$ .



11.(8 point) Consider the volume resulting from revolving about the line  $x = 2$  the region bounded by  $y = x^3$ ,  $y = 2$  and the  $y$ -axis. Sketch the region and find the volume.



12.(6 point) Sketch the region and **setup only** an integral to find the volume of the solid that results when the region enclosed by  $y = \sqrt{x-2}$ ,  $x$ -axis,  $y$ -axis and  $y = 3$  is revolved about the line  $y = -1$ .

