Prince Sultan University

Math 113
Final Examination
Spring Semester, Term 112
Sunday, May 27, 2012

Time Allowed: 120 minutes

Student Name:
Student ID #:
Instructor's Name:

Important Instructions:

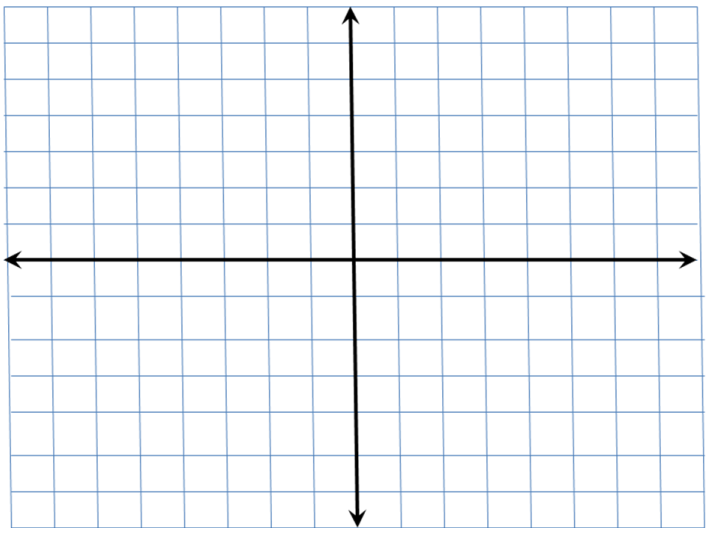
1. You may use a scientific calculator that does not have programming or graphing capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. There should be NO talking during the examination.
5. Your exam will be taken immediately if your mobile phone is 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
1,2,3	15	
4,5	12	
6,7	13	
8	10	
9	10	
10	18	
11	12	
12	10	
Total	100	

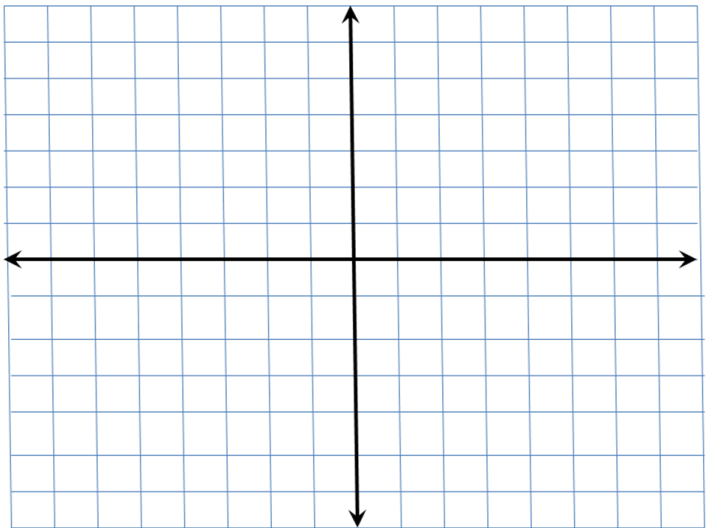
Q1. (5 points) Let $f(x) = 9 - 6x + x^2$. Find the all values of c that satisfy the conclusion of the Integral Mean Value Theorem over the interval $[2, 5]$

Q2. (5 points) Let $F(x) = \int_1^{x^2} \sqrt{t^3 + 1}\, dt$. Find $F(1)$, $F'(1)$, and $F''(1)$

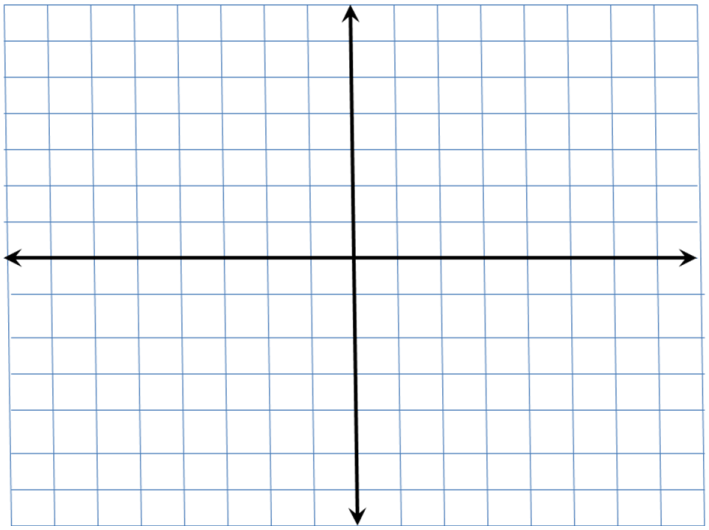
Q3. (5 points) Sketch the region enclosed by the curves: $x = y^2$ and $x = 4$, **then** find the bounded area.



Q4. (6 points) Find the volume of the solid that results when the region R bounded by the given curves $y = x^2$, $y = 2x$ is revolved about the *x*-axis



Q5. (6 points) Find the volume of the solid that results when the region R bounded by the given curves $y = \sqrt[3]{x}$, $y = 0$, $x = 0$, $x = 8$ is revolved about the line $x = -1$.



Q6. (5 points) Find the arc length of $y = \frac{1}{6}x^3 + \frac{1}{2x}$; between $x = 1$ and $x = 3$.

Q7. (8 points) Evaluate the following integrals:

i. $\int \cos\sqrt{x}\ dx$

ii. $\int \tan x \sec^4 x\ dx$

Q8. (10 points) Evaluate the following integrals:

i. $\int \frac{dx}{x^2\sqrt{x^2+4}}$

ii. $\int \frac{2x^2 - x + 4}{x^3 + 4x}\, dx$

Q9. (10 points) Determine whether the following integrals converge or diverge. **(<u>Show all your steps</u>)**.

i. $\int_0^{\infty} \frac{e^{2x}}{7+3e^{2x}}\,dx$

ii. $\int_0^{1} \frac{2}{\sqrt{1-x^2}}dx$

Q10. (18 points) Determine whether the following series converges or diverges.

1. $\sum_{n=1}^{\infty} \frac{n^n}{2^{n^2}}$

2. $\sum_{n=2}^{\infty} \frac{1}{n(\ln(n))^3}$

3. $\sum_{n=1}^{\infty} \frac{Sin^2\left(\frac{1}{n}\right)}{n^2}$

Q11. (12 points) Determine whether the following series absolutely convergent, conditionally convergent, or divergent.

i. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{\sqrt[4]{n}}$

ii. $\sum_{n=0}^{\infty} (-1)^n e^{-n}$

Q12. (10 points) Determine the radius and interval of convergence: $\sum_{k=1}^{\infty} \frac{(-1)^k}{\sqrt{k}}(3x-1)^k$