Prince Sultan University

MATH 211

Second Major Exam

First Semester 2007/2008, Term 071

Sunday, 6th January 2008

Dr. Aiman Mukheimer

Time Allowed: 90 minutes

Name: _____ _____ _____

(First) (Middle) (Last)

ID Number: _____

Serial No.: _____

Important Instructions:

- You may use CASIO scientific calculator that does not have programming or graphing capabilities.
- You may **NOT borrow** a calculator from anyone.
- There should be **NO talking** during the examination.
- Your exam will be taken **immediately** without any warning if your mobile is seen or heard
- You must show all your work beside the problem. Be organized.
- You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.
- This examination has **14** problems, some with several parts. Make sure that your paper has all these problems

Problems	Max points	Student's Points
1,2,3	21	
4,5,6,7	23	
8,9,10	20	
11,12	18	
13,14	18	
Total	100	

Q1. (7 points) Find an equation for the tangent line to the curve $x^3 + xy + y^3 = x$ at the point (1, 0).

Q2. (7 points) Find the intervals of increase and decrease for the function $f(x) = \frac{1}{4 - x^2}$

Q3. (7 points) Find all critical points of $f(x) = x^4 - 2x^2 + 3$, and use the second derivative test to classify each as a relative maximum, a relative minimum, or neither

Q4. (5 points) Find all vertical and horizontal asymptotes for the function: $g(x) = \dfrac{5x^2}{x^2 - 3x + 4}$.

Q5. (6 points) A manufacturer estimates that if he produces x units of a particular commodity, the total cost will be $C(x) = x^3 - 24x^2 + 350x + 400$ dollars. For what value of x does the marginal cost $M(x) = C'(x)$ satisfy $M'(x) = 0$?

Q6. (6 points) How much money should be invested today at an annual interest rate of 7% compounded continuously so that 20 years from now it will be worth $20000.

Q7. (6 points) Find the absolute maximum and minimum (if any) of the function $f(x) = (x^2 - 4)^5$ on the interval: $-3 \le x \le 2$

Q8. (8 points) Sketch the graph of $f(x) = x^3 + 3x^2 - 2$

Q9. (6 points) Use logarithmic differentiation to find the derivative of $f(x) = \dfrac{e^{-3x}\sqrt{2x-5}}{(7-9x)^3}$

Q10. (6 points) A study indicates that *x* months from now the population of a town will be increasing at the rate of $3+5x\sqrt{x}$ people per month. What will be the population increase by during the next 9 months from now?

Q11. (10 points) Evaluate the following integrals:

1. $\int \frac{1}{x}(x+1)^2\,dx$

2. $\int (x^3-2x^2)\left(\frac{1}{x}-5\right)dx$

Q12. (8 points) A manufacturer estimates that the marginal cost of producing q units of a certain commodity is $C'(q)=3q^2-24q+48$ dollars per unit. If the cost of producing 10 units is \$5000, what is the cost of producing 30 units?

Q13. (10 points) Evaluate the following integrals:

1. $\int \frac{1}{x^2}\left(\frac{1}{x}-1\right)^{2/3} dx$

2. $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$

Q14. (8 points) Find the area of the region **R** that lies under the curve $y = \sqrt{3x+4}$ over $0 \le x \le 4$