Prince Sultan University

MATH 211

First Major Exam

Second Semester 2008/2009, Term 081

Sunday, 18 January 2009

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 **10** problems, some with several parts. Make sure that your paper has all these problems

Problems	Max points	Student's Points
1,2	20	
3,4,5,6	20	
7	20	
8,9,10	20	
Total	80	

Q1. (12 points) Graph the function: $f(x) = x^3 + 4x^2 + 4x$. (**Show all your steps**)

Q2. (8 points) Suppose the total cost of producing x units of a certain commodity is $C(x) = 2x^4 - 10x^3 - 18x^2 + 200x + 167$. Determine the largest and smallest values of **the marginal cost** for $0 \le x \le 5$.

Q3. (5 points) Find *A* and *B* so that the graph of $f(x) = \frac{3 - Ax}{Bx + 11}$ has $y = 7$ as a horizontal asymptote and $x = 2$ as a vertical asymptote.

Q4. (5 points) A bank compounds interest continuously. What nominal interest rate does it offer if \$1,500 grows to \$2,500 in 10 years?

Q5. (4 points) Find $f''(x)$: $f(x) = 3\ln(2x^3 - 5x)$

Q6. (6 points) Use logarithmic differentiation to find $\frac{dy}{dx}$, where $y = (2x - 1)^3 (x + 5)^2 (1 - x)^5$

Q7. (20 points) Evaluate the following integrals:

1. $\int \sqrt[3]{8x}\ dx$.

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

3. $\int x\,(4x-5)^3\,dx$.

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

5. $\int_2^3 \frac{2x-3}{x^4}dx$.

Q8. (8 points)Determine the area of the region bounded by the curve $y = x^3 - 3x^2 + x + 5$ and the line y = x + 5.

Q9. (5 points) The average value of $f(x) = x^3 - 3x + k$ over the interval $1 \le x \le 5$ is 30. What is k?

Q10. (7 points) The marginal revenue from the sale of x units of a particular commodity is estimated to be $R'(x) = 50 + 3.5xe^{-0.01x^2}$ dollars per unit where $R(x)$ is revenue in dollars. Let $R(0) = 0$, what revenue should be expected from the sale of 1000 units.