Prince Sultan University

MATH 211

Final Exam

First Semester 2007/2008, Term 071

January, 21st January 2008

Dr. Aiman Mukheimer

Time Allowed: 120 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 **17** problems, some with several parts. Make sure that your paper has all these problems

Problems	Max points	Student's Points
1,2,3	16	
4,5,6,7	20	
8,9,10,11	20	
12,13	16	
14,15	16	
16,17	12	
Total	100	

Q1. (5 points) Find the equation of the line that is tangent to the graph of the function: $y = \sqrt[3]{\frac{x}{x+2}}$ at the value of $x = -1$

Q2. (5 points) Find $\frac{dy}{dx}$, where $(x - 3y)^3 = y + 5$

Q3. (6 points) when the price of a certain commodity is p dollars per unit, customers demand x hundred units of the commodity, where:

$$x^2 + 3px + p^2 = 79$$

How fast is the demand x changing with respect to time when the price is \$5 per unit and is decreasing at the rate of **30 cents** per month?

Q4. (4 points) Find all **critical points** of the function $f(t) = \sqrt{t^2 - 2t + 2}$

Q5. (3 points) A company has profit defined by: $p(t) = 4t^2 - 30t$. Does the profit increase or decrease at $t = 2$?

Q6. (6 points) Determine where the graph of $g(x) = \frac{1}{x^2 + 3}$ is concave up and concave down.

Q7. (7 points) A manufacturer can produce radios at a cost of $10 apiece and estimates that if they are sold for x dollars apiece, consumers will buy approximately $200e^{-0.2x}$ radios per month. Find the price at which the manufacturer should sell the radios to maximize the profit.

Q8. (6 points) Find the absolute maximum and minimum of the function $f(x) = \frac{1}{x^2 - 9}$ on the interval; $0 \leq x \leq 2$

Q9. (5 points) If $1,000 is invested at 8% annual interest, **compounded continuously,** how long will it take investment to double?

Q10. (4 points) Find the function $f(x)$ whose tangent has slope: $e^{-x} + x^2$ for each value of x and whose graph passes through the point: (0, 4).

Q11. (5 points) Determine the area of the region bounded by the curves $y = e^x$ and $y = e^{-x}$ between $x = 0$ and $x = \ln 2$.

Q12. (12 points) Evaluate the following integrals:

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

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

3. $\int_{1/3}^{1/2} \frac{e^{1/x}}{x^2}\,dx$

Q13. (4 points) Compute f_x and f_y for $f(x, y) = 4x^6y - 3x + e^{xy}$

Q14. (6 points) For the demand function $D(q) = \dfrac{400}{(0.2q+1)^2}$ dollars per unit, find the total amount of money consumers are willing to spend when q = 3 units.

Q15. (10 points) Evaluate the following integrals:

1. $\int (2-3x)e^{-2x}\,dx$

2. $\int x \ln(x+2)\,dx$

Q16. (6 points) Records indicate that *t* hours past midnight; the temperature at the local airport was $f(t) = -0.2t^3 + kt^2 + 5$ degrees Celsius. If the average temperature between 11 A.M. and 1 P.M. is 50 degrees Celsius, what is the value of ***k***?

Q17. (6 points) Describe **and** sketch the <u>domain</u> for the following functions:

1. $f(x, y) = \dfrac{x}{(x^2 + y^2 - 16)^{1/2}}$

2. $f(x, y) = \ln(2 + x + y)$