Prince Sultan University

MATH 211

Second Major Exam

Second Semester 2007/2008, Term 072

Monday, 19th May 2008

Dr. Aiman Mukheimer

Time Allowed: 90 minutes

Name: _____ _____ _____

(First) (Middle) (Last)

ID Number: _____

Serial No.: _____

Important Instructions:

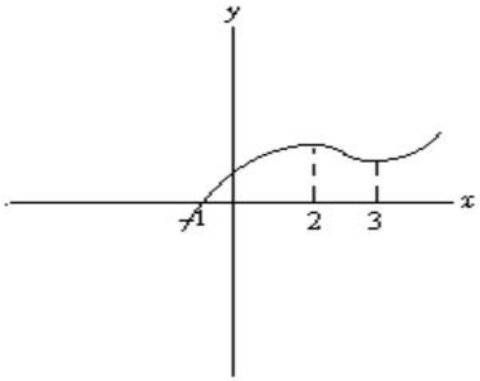
- You may use CASIO scientific calculator that does not have programming or graphing capabilities.
- You may **NOT borrow** a calculator from anyone.
- There should be **NO talking** during the examination.
- Your exam will be taken **immediately** without any warning if your mobile is seen or heard
- 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 **12** problems, some with several parts. Make sure that your paper has all these problems

Problems	Max points	Student's Points
1,2,3	24	
4,5,6,7	25	
8,9	26	
10,11,12	25	
Total	100	

Q1. (8 points) If the cost of a commodity is $C(x) = \frac{1}{8}x^2 + 3x + 98$ dollars when x units are produced and the selling price is $p(x) = \frac{1}{3}(75 - x)$ dollars per unit. Find the level of production where it has the maximum profit**.**

Q2. (8 points) Find all intervals where:

1. The derivative of the function shown is positive.
2. The derivative of the function shown is negative.
3. The concavity of the function in up.
4. The concavity of the function in down.
5. The critical numbers



Q3. (8 points) Let $f(x) = 20 - Ae^{kx}$, $f(0) = 5$, and $f(2) = 3$. Find $f(4)$

Q4. (7 points) Determine intervals of concavity **and** find the inflection point(s) (if any) of the function: $f(x) = x^3 + 6x^2 - 13$

Q5. (6 points) Suppose $1,500 is invested at, an annual interest rate of 8 percent **compounded quarterly**. Compute the balance after 12 years.

Q6. (6 points) Find the absolute maximum and minimum of the function
$f(x) = \frac{1}{6}(x^3 - 6x^2 + 9x + 1)$ on the interval $0 \le x \le 2$

Q7. (6 points) Solve for x: $2\ln x - \frac{1}{3}\ln x^2 = 4$

Q8. (8 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 get the maximum profit.

Q9. (18 points) Evaluate the following integrals:

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

2. $\int x \sqrt[3]{4x^2-9}\,dx$

3. $\int_0^1 \frac{3x^5}{x^6+e} dx$

Q10. (9 points) Find the area of the region **R** that bounded by the curves $y = e^{x}$, $y = e^{-x}$, and the line $x = \ln 2$

Q11. (8 points) Use logarithmic differentiation to find the derivative of

$$f(x) = e^{-9x^{2}}(3+4x)^{5}\sqrt{8x^{3}-35}$$

Q12. (8 points) Records indicate that t hours past midnight, the temperature at the local airport was $f(t) = -0.3t^{2} + 4t + 10$ degrees Celsius. What was the average temperature at the airport between 9:00 A.M. and noon?