Prince Sultan University
MATH 211
First Major Exam
Second Semester 2008/2009, Term 082
Monday, 20 April 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 **14** problems, some with several parts. Make sure that your paper has all these problems

Problems	Max points	Student's Points
1,2,3,4	15	
5,6,7,8	17	
9,10,11	13	
12,13,14	15	
Total	60	

Q1. (3 points) What is the domain of the function $f(t) = \dfrac{\sqrt{t^2 - 49}}{t - 7}$?

Solution:

Q2. (4 points) The cost of renting a backhoe at one distributor is $320, plus $35 per day. Write a linear function $C(x)$ that describes the cost of renting the backhoe for x days, then use your function to find how much it would cost to rent it for 20 days.

Solution:

Q3. (4 points) Suppose the total cost (in dollars) of manufacturing q units of a certain commodity is given by the function $C(q) = q^3 - 17q^2 + 300q + 200$. What is the cost of producing the 10th unit of the commodity?

Solution:

Q4. (4 points) Find the slope and y-intercept of the line $\frac{x}{5} + \frac{y}{6} = 1$.

Solution:

Q5.(5 points) Complete the table by evaluating $f(x)$ at the specified values of x. **Then use the table to** estimate the indicated limit, or show that it does not exist.

$f(x) = \dfrac{9x+4}{x-6}$; $\lim\limits_{x \to 6} f(x)$

x	5.9	5.99	5.999	6	6.001	6.01	6.1
$f(x)$							

Solution:

Q6. (3 points) Find the limit as $x \to 11$ of $\dfrac{\sqrt{5x-30}-6}{x-11}$

Solution:

Q7. (4 points) Show whether the function $f(x) = \begin{cases} x+2 & \text{if } x < 4 \\ -5x - 22 & \text{if } x \geq 4 \end{cases}$; is continuous at $x = 4$.

Solution:

Q8. (5 points) Find the equation of the line that is tangent to the curve $f(x) = \dfrac{5x^2 - 7x + 1}{5 - 4x^3}$ at the point $(1, -1)$.

Solution:

Q9. (5 points) If the total cost of manufacturing q units of a certain commodity is $C(q) = (3q + 1)(5q + 7)$, **<u>use marginal analysis</u>** to estimate the cost of producing the 19th unit, in dollars.
Solution:

Q10. (4 points) Differentiate and simplify: $f(x) = \frac{2}{7} x^{14} - \frac{2}{5} x + \frac{8}{8x} - \sqrt[3]{x}$.
Solution:

Q11. (4 points) Find the equation of the tangent line to the curve $x^4 y^4 - 5xy = 9x + y - 9$ at the point $(0, 9)$.
Solution:

Q12. (5 points) Find the intervals of increase and decrease for $f(x) = 6x^3 + 54x^2 - 288x - 7$.
Solution:

Q13. (5 points) The revenue derived from the production of x units of a particular commodity is $R(x) = \dfrac{80x - x^2}{x^2 + 80}$ million dollars.
   1. What level of production results in maximum revenue?
   2. What is the maximum revenue?
Solution:

Q14. (5 points) Let $f(x) = 2x^3 - 3x^2 - 12x + 13$. Find all critical points of f **and** use the second derivative test to classify each as a relative maximum, a relative minimum, or neither.
Solution: