Prince Sultan University

MATH 211

First Major Exam

First Semester 2008/2009, Term 081

Monday, 1 December 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 **15** problems, some with several parts. Make sure that your paper has all these problems

Problems	Max points	Student's Points
1,2,3,4	18	
5,6,7	19	
8,9,10,11	22	
12,13,14,15	21	
Total	80	

Q1. (4 points) What is the domain of the function $f(x) = \dfrac{x^2 - 25}{x + 9}$?

Q2. (4 points) A ball is thrown upward in such a way that *t* seconds later, it is $s = -16t^2 + 64t + 80$ feet above the ground. How many seconds later does the ball hit the ground?

Q3. (4 points) Where do the lines $y = x + 3$ and $y = 2x + 4$ intersect?

Q4. (6 points) The revenue derived from the production of *x* units of a particular commodity is $R(x) = \dfrac{3x - x^2}{x^2 + 3}$ million dollars. What level of production results in maximum revenue? What is the maximum revenue?

Q5. (8 points) Find the following indicated limit if it exist:

1. $\lim_{x \to 36^-} \left[\dfrac{\sqrt{x} - 6}{x - 36} \right]$

2. $\lim_{x \to -\infty} \left[\dfrac{1 - 2x^3}{5x^4 + x^2} \right]$

Q6. (5 points) For which value(s) of x is the following function not continuous? Explain.

$$f(x) = \begin{cases} x - 2 & \text{if } x < 2 \\ 1 & \text{if } x = 2 \\ 2 - x & \text{if } x > 2 \end{cases}$$

Q7. (6 points) Find an equation for the tangent line to the curve $y = \sqrt{2 + \dfrac{1}{5}x}$ at the point where $x = -1$.

Q8. (6 points) Find all points on the graph of the function $f(x) = \frac{x^2}{x+2}$ where the tangent line is horizontal.

Q9. (6 points) An efficiency study at a certain factory indicates that an average worker who arrives on the job at 8:00 A.M. will have produced $Q(t) = -t^3 + 6t^2 + 18t$ units t hours later. At what rate, in units/hour, is the worker's rate of production changing with respect to time at 9:00 A.M.?

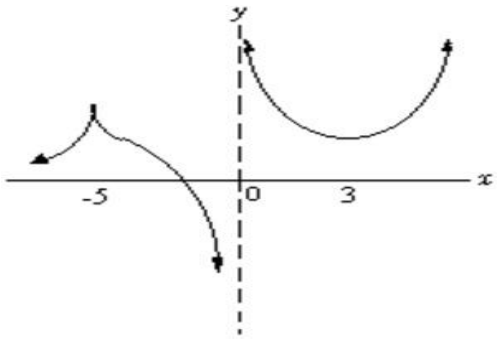
Q10. (4 points) If $f(x) = \sqrt[3]{x} - \frac{1}{\sqrt{x}}$, differentiate $f(x)$.

Q11. (6 points) Find $\frac{dy}{dx}$, where $xy^3 - 3x^2 = 7y$.

Q12. (6 points) Find the intervals of increase and decrease for the function $f(x)=\dfrac{x-1}{x^2+3}$.

Q13. (4 points) Find $\dfrac{dy}{dx}$ if $y=\sqrt[3]{u}$ and $u=x^4-3x^3-7$.

Q14. (4 points) Find all intervals where the derivative of the function shown below is negative.



Q15. (7 points) Determine where the graph of $g(x)=\dfrac{1}{x^2+3}$ is concave up and concave down.