Prince Sultan University

MATH 211

First Major Exam

Second Semester 2007/2008, Term 072

Monday, 31 March 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 **13** problems, some with several parts. Make sure that your paper has all these problems

Problems	Max points	Student's Points
1,2,3,4	25	
5,6,7	25	
8,9,10,11	25	
12,13	25	
Total	100	

Q1. (4 points) What is the domain of the function: $f(t) = \dfrac{\sqrt{t^2 - 1}}{t - 3}$

Q2. (7 points) If an object is thrown vertically upward with an initial speed of 128 ft/sec, its height (in feet) t seconds later is given by $H(t) = -16t^2 + 128t$. Graph and determine when the object hits the ground.

Q3. (5 points) Find the slope and y-intercept (if they exist) of the line $\frac{x}{2} + \frac{y}{3} = 1$

Q4. (9 points) A furniture manufacturer can sell dining room tables for \$70 apiece. The manufacturer's total cost consists of a fixed overhead of \$8000 plus production costs of \$30 per table.

1. How many tables must the manufacturer sell to brake even?

2. How many tables must the manufacturer sell to make a profit of \$6000?

3. What will be the manufacturer's profit or loss if 150 tables are sold?

Q5. (10 points) Find the following indicated limit if it exist:

1. $\lim_{x \to 1} \dfrac{x^2 + 4x - 5}{x^2 - 1}$

2. $\lim_{x \to \infty} \dfrac{1 - 2x^3}{x + 1}$

Q6. (7 points) Find all values of c that make the function $f(x)$ continuous for all x.

$$f(x) = \begin{cases} cx + 11 & x < -2 \\ cx^2 + 3 & x \geq -2 \end{cases}$$

Q7. (8 points) Find the equation of the tangent line to the curve of $f(x) = (3\sqrt{x} + x)(2 - x^2)$ at the point where $x = 1$.

Q8. (6 points) Find all points on the graph of $f(x)=\dfrac{x^2+x-1}{x^2-x+1}$, where the tangent line is horizontal

Q9. (7 points) The gross annual earnings of a certain company were $A(t)=0.1t^2+10t+20$ thousand dollars where *t* years after its formation in 2000.
At what percentage rate were the gross annual earnings growing with respect to time in 2004?

Q10. (6 points) Let $f(x)=\dfrac{\left(4-\sqrt[3]{x}\right)^5}{\left(x^2+1\right)^3}$, find $f'(x)$

Q11. (6 points) Find $\dfrac{dy}{dx}$, where $(x-3y)^3=y+5$.

Q12. (10 points) Find an equation for the tangent line to the curve $x^3 + xy + y^3 = x$ at the point (1, 0).

Q13. (15 points) Suppose the total cost in dollars of manufacturing q units is $C(q) = 3q^2 + q + 500$

1. Use the marginal analysis to estimate the cost of manufacturing the 41st unit.

2. Compute the actual cost of manufacturing the 41st unit.