PRINCE SULTAN UNIVERSITY

MATH 211 BUSINESS CALCULUS

MAJOR EXAM 1 11th NOVEMBER 2009

Start: **6:00 p.m.**
End: **7:30 p.m.**

Name: _____

I.D. _____

Instructors Name: _____ **Section:** _____

1. Answer all questions
2. This exam consists of 1 Cover Sheet & 4 Question Sheets with 11 questions.
3. You can use a calculator, **NOT** a mobile phone.
4. No talking during the test.
5. Show all working out in the space provided.

Question No.	Max. Points	Points Scored
1,2,3	20	
4,5,6	26	
7,8,9	24	
10,11	20	
TOTAL POINTS	90	
TOTAL	20	

1) [4 points] Find the domain of $f(x) = \frac{\sqrt{x-3}}{x-7}$

2) [10 points] A manufacturer can sell TV's for $500 apiece. The manufacturers total cost consists of a fixed overhead of $9000 plus production costs of $250 per TV.

   a) How many TV's must be sold to break even?

   b) What is the profit or loss if 30 TV's are sold?

   c) How many TV's must be sold to realize a profit of $2250?

3) [6 points] Use a table of at least four values to estimate the following limit:
$\lim_{x \to 2} \frac{x^3 - 2x^2}{2x - 4}$

4) [12 points] Find the value of the following limits:

a) $\lim_{x \to 3} 3x^3 + 2x^2 + 7x - 12$

b) $\lim_{x \to 5} \frac{2x^2 - 7x - 15}{x^2 - 25}$

c) $\lim_{x \to -\infty} \frac{-12x^4 + 500x^3 - x^7 + 7x}{3x^2 - 12x}$

5) [6 points] Find the value of k that will make the function continuous everywhere:

$$f(x) = \begin{cases} x + 2k & x \leq 1 \\ kx^2 + x + 1 & x > 1 \end{cases}$$

6) [8 points] The total debt owed by Mexico to the International Monetary Fund is given by $D(t) = t^2 + 2t^{3/2} + 102$ billion dollars, t years after 2001.

a) At what rate was the debt changing with respect to time in 2005?

b) At what percentage rate was the debt changing with respect to time in 2005?

7) [6 points] Find the **coordinates** of all the points on the graph of $y = (x-1)(x^2 - 8x + 7)$ where the tangent line is horizontal.

8) [6 points] Find the equation of the normal (perpendicular) to the tangent line to the graph of $y = 2x^3 - 5x + 1$ at $x = 3$.

9) [12 points] Differentiate the following functions:

a) $f(x) = \sqrt[3]{x} - \frac{2}{\sqrt{x}}$

b) $f(x) = \frac{2 - 3x^2}{x^3 + x - 1}$

c) $f(x) = \frac{1}{(2x^2 + 3)^2}$

10) [8 points] At a certain factory, the total cost of manufacturing q units is $C(q) = 0.2q^2 + q + 900$ dollars. It has been determined that $q(t) = t^2 + 100t$ units are manufactured during the first t hours.

Find the rate at which the total manufacturing cost is changing with respect to time 1 hour after the start of production.

11) [12 points] A manufacturer determines that when x units of a particular commodity are produced, the total cost will be $C(x) = \frac{1}{4}x^2 + 3x + 67$, and furthermore, that all x units will be sold when the price is $p(x) = \frac{1}{5}(45 - x)$ dollars per unit.

a) Find the marginal cost and the marginal revenue.

b) Use the marginal cost to estimate the cost of producing the fourth unit.

c) Find the actual cost of producing the fourth unit.