PRINCE SULTAN UNIVERSITY

MATH 211 BUSINESS CALCULUS

MAJOR EXAM I March 2011

Start : **10:00 AM**

End: **11:30 PM.**

Name: _____ **I.D.** _____

1. Answer all questions
2. This exam consists of 5 pages, 8 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		
TOTAL		

Q1. a) Find the intercepts of the curve $y = 2x^3 + x^2 - 18x - 9$.

b) A manufacturer determines that when *x* hundred units of a particular commodity are produced, the profit will be $f(x) = -4000x^2 + 68000x - 120000$ dollars.

i. Determine the level of production where the production is profitable.

ii. Find the maximum profit.

c) Find the domain of the function $f(x) = \sqrt{8 - x^2} + 5x^5 - 3x + 10$

d) Evaluate the following limits:

i. $\lim_{x\to\infty} \frac{3x-5x^2-4x^4}{2x^4-\sqrt{3}x^2-1}$

ii. $\lim_{x\to 3} \frac{2x^2-5x-3}{\sqrt{x-2}-1}$

iii. $\lim_{x\to 1^+} f(x)$, where $f(x) = \begin{cases} 3x - 7 & if\ x < 1 \\ 5x^3 - 5x & if\ x \geq 1 \end{cases}$

Q2. a) Study the continuity of the function $f(x) = \frac{x^3+5}{2x^2-5x+3}$

b) Use the definition to find the derivative of the function $f(x) = \frac{-2}{x+3}$.

c) At a certain factory, the total cost of manufacturing q units during the daily production run is $C(q) = 0.3q^2 + 0.8q + 800$ dollars. It has been determined that approximately $q(t) = t^2 + 80t$ units are manufactured during the first t hours of a production run. Compute the total manufacturing cost after 2 hours of the beginning of production.

d) Find the derivative of the functions

i. $f(x) = \frac{2}{3}x^6 - \frac{5x}{6} + \frac{2}{3x} - \sqrt{x^3}$

ii. $y = \frac{2x-5}{x^3-2}$

iii. $y = (2x^3 - 5x + 1)(8x^2 - 9x + 2)$

Q3. a) The gross national product (GNP) of a certain country is $N(t) = t^2 + 3t + 121$ billion dollars where *t* is the number of years after 1990. At what percentage rate will the GNP be changing with respect to time in 1995?

b) 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 percentage rate is the worker's rate of production changing with respect to time at 10:00 A.M.?

c) Find the points on the curve $y = 4x^3 - 12x^2 + 10$ where the tangent line is horizontal.