King Fahd University of Petroleum and Minerals
Department of Math & Stat
MATH 132 – Applied Calculus
EXAM I
2009-2010 (092)

Tuesday, March 30, 2010 **Time Allowed: 90 minutes**

Name: _____ Serial #: _____

ID #: _____ Section #: _____

Instructions:

1. **Calculators and Mobiles are not allowed.**
2. Write neatly and legibly. You may lose points for messy work.
3. **Show all your work**. No points for answers without justification.
4. Make sure that you have 8 different problems (8 pages + cover page)

Problem No. #	Grade	Maximum Points
1		12
2		12
3		12
4		12
5		12
6		14
7		14
8		12
Total		100

Q1. (a) (8-points) Find $\lim_{x \to -2} \dfrac{x^3 + 8}{x^4 - 16}$.

(b) (4-points) Evaluate: $\lim_{x \to 3^+} \dfrac{3 - x}{x^2 - 6x + 9}$. (Use the symbol $+\infty$ or $-\infty$, if appropriate).

Q2. (12-points) Let

$$f(x) = \begin{cases} 2 - x^2 & \text{if } x > 1 \\ -2 + 3x & \text{if } 0 \leq x \leq 1 \\ 4 - x^2 & \text{if } x < 0. \end{cases}$$

Check continuity of this function at the points $x = 0, 1$.

Q3. (12-points) Suppose that $f(x) = \sqrt{x}$.

(a) Find $f'(x)$ by using the definition of derivative.

(b) What is the slope of this curve at $x = 1, 0$.

(a)

(b)

Q4. (12-points) If $\overline{c}$, the average cost per unit, is given by

$$\overline{c} = \frac{38}{q} + 400 - 25q + 11q^2$$

where q is the total number of units produced, then find the marginal cost for 8 units.

Q5. (a) (8-points) If $g(x) = \dfrac{3\sqrt{x}}{x+4}$, then find $g'(1)$.

(b) (4-points) Find y'' where $y = \left(3 + 2x^3\right)^{5/2}$.

Q6. (a) (10-points) Find an equation of the tangent line to the curve $x^3 + xy + y^2 = 3$ at the point $(1, 1)$.

(b) (4-points) For $y = e^{x^2 \ln(x^2)}$, find y'.

Q7. (14-points) If $y = (4x)^{-x}$, then find the value of x for which the percentage rate of change of y with respect to x is 50.

Q8. (12-points) Suppose that the savings function of a country is

$$S = \frac{I - 2\sqrt{I} - 8}{\sqrt{I} + 2}$$

where the national income I and national savings S are measured in billions of dollars. Find the country's marginal propensity to consume and its marginal propensity to save when the national income is \$ 100 billion.