KOÇ UNIVERSITY

MATH 102 - CALCULUS

Midterm II December 10, 2009

Duration of Exam: 90 minutes

INSTRUCTIONS: No calculators may be used on the test. No books, no notes, and no talking allowed. You must always **explain your answers** and **show your work** to receive **full credit**. Use the back of these pages if necessary. **Print (use CAPITAL LETTERS) and sign your name, and indicate your section below.**

Surname, Name: _____

Signature: _____

Section (Check One):

Section 1: S. Ünver (MW, 9:30) ___
Section 2: S. Ünver (MW, 15:30) ___
Section 3: Y. Arkun (TT, 12:30) ___

PROBLEM	POINTS	SCORE
1	10	
2	5	
3	30	
4	15	
5	15	
6	10	
7	15	
TOTAL	**100**	

Problem 1. (10 pts) Compute the derivatives of the following functions:

(a) (5 pts) $\sqrt{2sin^2(3x)+5}$

(b) (5 pts) $ln(sin(e^x)))$

Problem 2. (5 pts) Find the following limit:

$\lim_{x \to 0} \frac{1-cos(x)}{sin(x)}$

Problem 3. (30 pts) Let $f(x) = x^3 - 6x + 2$.

(a) (5 pts) Find the intervals on which f is increasing/decreasing.

(b) (5 pts) Find the local maximum/minimum point(s) of f.

(c) (5 pts) Find the intervals on which f is concave up/down.

(d) (5 pts) Find the inflection point(s) of f.

(e) (10 pts) Sketch a graph of f.

Problem 4. (15 pts.) The following cost function is given

$$C(x) = 16000 + 200x + 4x^{3/2},$$

where x represents the production level (units produced). Find the production level that will minimize the average cost and find the corresponding minimum average cost.

Problem 5. (15 pts.) Find the dimensions of the rectangle of largest area that has its base on the x-axis and its other two vertices above the x-axis and lying on the parabola $y = 27 - x^2$.

Problem 6. (10 pts.) Find $\frac{dy}{dx}$ by implicit differentiation if

$$xcos(y) + ycos(x) = 1.$$

Problem 7. (15 pts) Evaluate the following integrals:

(a) (5 pts) $\int_0^1 \sqrt{x}dx$

(b) (5 pts) $\int_{-1}^1 |x^3|dx$

(c) (5 pts) $\int_0^{ln(2)} e^x dx$