KOÇ UNIVERSITY
MATH 102 - CALCULUS
Midterm 1   November 11, 2008
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: T. Etgu (11:00)	——
Section 2: T. Etgu (15:30)	——
Section 3: S. Unver (9:30)	——

PROBLEM	POINTS	SCORE
1	20	
2	20	
3	20	
4	20	
5	20	
TOTAL	**100**	

Problem 1. Compute the following limits:

(i) $\lim_{x \to 0} \frac{\sin(2x)}{\sin(3x)}$

(ii) $\lim_{x \to 9} \frac{\sqrt{x}-3}{x-9}$

(iii) $\lim_{x \to \infty} \frac{5x^3 - 2x^2 - 3}{10x^3 - 5x + 2}$

(iv) $\lim_{x \to 0} \frac{|x|}{x}$

Problem 2. Compute the derivatives of the following functions. *(10 points each)*

(i) $\left(\frac{x^2}{8} + x - \frac{1}{x} \right)^4$

(ii) $x^2 \sin^4(x) + x \cos^{-2}(x)$

Problem 3. Let $y = f(x)$ be a function that has the property that $f(1) = 2$ and satisfies the equation $x^3 - xy + y^3 = 7$. *(10 points each)*

(i) Find $f'(1)$.

(ii) Find an equation of the tangent line to the graph of $y = f(x)$ at $x = 1$.

Problem 4.

(i) State the intermediate value theorem. *(5 points)*

(ii) State Rolle's theorem. *(5 points)*

(iii) Show that the equation $x^3 + 10x - 2 = 0$ has only one solution over the real numbers. *(10 points)*

Problem 5. Let $f(x) = x^{2/3}(3 - x)$. *(10 points each)*

(i) Find all the critical points of $f(x)$ on $[-2, 2]$.

(ii) Find the absolute maximum and minimum values of $f(x)$ on $[-2,2]$.