KOÇ UNIVERSITY

MATH 106 - CALCULUS

Midterm I March 6, 2007

Duration of Exam: 60 minutes

INSTRUCTIONS: Calculators may not 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 - 11:30 ___
Section 2 - 14:30 ___

PROBLEM	POINTS	SCORE
1	27	
2	23	
3	38	
4	12	
TOTAL	**100**	

1. Evaluate the following limits without using l'Hopital's rule. Specify infinite limits and if the limit does not exist give the reason.

(a) (9 points) $\lim_{x\to 1} \dfrac{\sqrt{5-x}-2}{x-1}$

(b) (9 points) $\lim_{x\to 0} \dfrac{1-\cos x}{x^2}$

(c) (9 points) $\lim_{x\to 0^+} \sqrt{x}\cos^2\left(\dfrac{1}{x}\right)$

2. (12 points) Find the asymptotes (horizontal, vertical, oblique, if exist) of the function $f(x) = \dfrac{4x^3+5}{-x^2-7x}$.

(b) (11 points) Prove that $\lim\limits_{x \to 1} \dfrac{2x^2+2x-4}{x-1} = 6.$

3. (a) (8 points) Find $\dfrac{dy}{dx}$ for $y = (2x+2)^3(x^2-1)$.

(b) (8 points) Find $f'(x)$ for $f(x) = \dfrac{\sin x^2}{x^2}$.

(c) (10 points) The limit $\displaystyle\lim_{h\to 0} \frac{(h-1)^2-1}{h}$ equals $f'(a)$ for some function $f(x)$ and some constant a. Determine $f(x)$ and a.

(d) (12 points) Find an equation for the line tangent to the curve $x = \sin t$, $y = \sqrt{3}\cos t$ at the point defined by $t = 2\pi/3$.

4. (12 points) Suppose that $f(x)$ is a continuous function with consecutive zeros at $x = a$ and $x = b$; that is, $f(a) = f(b) = 0$ and $f(x) \neq 0$ for $a < x < b$. Further, suppose that $f(c) \geq 0$ for some number c between a and b. Use the Intermediate Value Theorem to argue that $f(x) > 0$ for all $a < x < b$.