KOÇ UNIVERSITY

MATH 102 - CALCULUS

Midterm II April 28, 2009

Duration of Exam: 90 minutes

INSTRUCTIONS: No calculators may be used on the test. No books, no notes, and 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: Aybike Özer M-W (15:30) ___
Section 2: Burak Özbağcı M-W (14:00) ___
Section 3: E. Şule Yazıcı Tu-Th(11:00) ___
Section 4: E. Şule Yazıcı Tu-Th(14:00) ___
Section 5: Sinan Ünver M-W(11:00) ___

PROBLEM	POINTS	SCORE
1	35	
2	10	
3	10	
4	20	
5	25	
TOTAL	**100**	

Problem 1. (35 points) Calculate the following integrals

(a) $\displaystyle\int \frac{\cos x}{\sin^5 x}\, dx =$

(b) $\displaystyle\int_{-1}^{2} |x^3|\, dx =$

(c) $\displaystyle\int \sqrt{x^3} + \frac{1}{\sqrt[3]{x^5}}\, dx =$

(d) $\displaystyle\int_0^1 3x^2\, dx =$

(e) $\displaystyle\int_e^{e^2} \frac{(\ln x)^5}{x}\, dx =$

(f) $\displaystyle\int_0^1 xe^{x^2}\, dx =$

(g) $\displaystyle\int \frac{3x}{x^2+1}\, dx =$

Problem 2. (10 points) Find the critical points of the function $f(x) = \displaystyle\int_0^x (1 - e^{t^2-1})\, dt$

Problem 3. (10 pts) Calculate the following limit using the L'hospital rule

$$\lim_{x\to\infty} x \tan\frac{1}{x} =$$

Problem 4. (20 pts) If $1200cm^2$ of material is available to make a box with a square base and an open top, find the largest possible volume of the box.

Problem 5. A continuous function f satisfies the properties given below.

(1) The domain of f is $\mathbb{R}$

(2) $f(-1) = 0$; $f(2) = 0$; $f(0) = 1$.

(3) $\lim_{x\to\infty} f(x) = -\infty$; $\lim_{x\to-\infty} f(x) = 1$

(4) $f'(x) > 0$ when $x \in (-1, 1)$; $f'(x) < 0$ when $x \in (-\infty, -1) \cup (1, \infty)$; and $f'(-1) = f'(1) = 0$

(5) $f''(x) > 0$ when $x \in (-\sqrt{3}, 0)$; $f''(x) < 0$ when $x \in (-\infty, -\sqrt{3}) \cup (0, \sqrt{3}) \cup (\sqrt{3}, \infty)$; $f''(-\sqrt{3}) = f''(0) = f''(\sqrt{3}) = 0$

(a) (5 points) Find the local maximum points and local minimum points of f.

(b) (5 points) Find inflection points and the intervals where the graph of f is concave up or concave down.

(c) (5 points) Find the asymptotes of f.

(d) (10 points) Sketch the graph of a function f which satisfies the properties above.