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KOÇ UNIVERSITY  
MATH 106 - CALCULUS  
Midterm III      May 9, 2007

**Duration of Exam: 75 minutes**

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**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 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	20	
2	26	
3	30	
4	30	
<b>TOTAL</b>	<b>106</b>	

1. (a) (10 points) The region between the curve  $y = \cos x$ ,  $0 \leq x \leq \frac{\pi}{4}$  and the  $x$ -axis is revolved about the  $x$ -axis to generate a solid. Find its volume.

(b) (10 points) Find the length of the curve  $y = 2x^{3/2} + 1$  from  $x = 0$  to  $x = 1$ .

2. Calculate the following integrals.

(a) (8 points)  $\int e^x(3e^x + 1)^3 dx$

(b) (10 points)  $\int_1^2 \frac{2 \ln x}{x} dx$

(c) (8 points)  $\int \frac{dx}{\sqrt{16 - x^2}}$

3. Calculate the following integrals.

(a) (10 points)  $\int x \sin x \, dx$

(b) (10 points)  $\frac{dx}{(x+1)(x^2+1)}$

(c) (10 points)  $\int_{-\infty}^0 \frac{2x \, dx}{(x^2+1)^2}$

4. (a) Determine whether the following sequences  $\{a_n\}$  converges or diverges. If the sequence converges, find its limit.

(i) (8 points)  $a_n = \sqrt[n]{10n}$

(ii) (8 points)  $a_n = \left(1 + \frac{5}{n}\right)^n$

(b) Determine whether the following series converges or diverges. If the series converges, find its sum.

(i) (6 points)  $\sum_{n=1}^{\infty} \frac{2n^3 + n - 1}{3n^3 - n^2 + 1}$

(ii) (8 points)  $\sum_{n=0}^{\infty} \frac{3^{n+1}}{4^n}$