
KOÇ UNIVERSITY

MATH 106 - CALCULUS

Midterm III May 9, 2007

Duration of Exam: 75 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 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 | |
| TOTAL | 106 | |

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