

King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences

Math 102 (051)

Second Major Exam

Time: 80 Minutes

Marks: 100

Name: _____

ID #: _____

Serial #: _____

Section #: () $\left[\begin{array}{l} \text{At 7:00 a.m., Sec. \# 01} \\ \text{At 8:00 a.m., Sec. \# 02} \end{array} \right]$.

INSTRUCTIONS:

- Show all work. Do not omit steps.
- Use of calculator is not allowed.
- Write the formula: test or theorem you use.
- Write clearly and legibly. Do not do messy work.
- Be as much organized as possible.

Good luck!

Dr. Mohammad Iqbal

- Q1. Use cylindrical shells to find the volume of the solid generated, when the region enclosed by the curves $xy = 4$ and $x + y = 5$, is revolved about the x -axis.

(20 points)

Q2. Calculate the area of the surface generated by the revolution of the curve

$$x = a(t - \sin t), \quad y = a(1 - \cos t) \text{ about the line } y = 0 \text{ where } 0 \leq t \leq \pi.$$

(25 points)

Q3. solve the integral

$$I = \int \frac{x \tan^{-1}(x) dx}{(1+x^2)^2}.$$

(20 points)

Q4. Evaluate the integral

$$I = \int \csc^4(x) dx.$$

(15 points)

Q5. Use partial fractions to evaluate the integral

$$I = \int \frac{2x \, dx}{(x-1)(x^2+5)} .$$

(20 points)