

King Fahd University of Petroleum and Minerals

Department of Mathematical Sciences

Math 102 (051)

Final Exam

Time: 2 $\frac{1}{2}$ Hours

Marks: 200

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. Evaluate the integral $\int_{-2}^2 \frac{x^3 - 9}{1 + |x|} dx$.

(20 points)

Q2. Evaluate the integral $\int_{\pi/6}^{\pi/2} \left(x + \frac{2}{\sin^2 x} \right) dx$. (20 points)

Q3. Find the volume of the solid, enclosed by the curves $x = y^2$ and $x = y + 2$ when the region is revolved about the y -axis. (25 points)

Q4. Find the length of the curve given by the parametric equations

$$x = a \cos^3 t, \quad y = a \sin^3 t \text{ and } 0 \leq t \leq \pi/2.$$

(20 points)

Q5. Evaluate the integral $\int x e^x (x + 1)^{-2} dx$.

(20 points)

Q6. Evaluate the integral $\int \left(\frac{x}{1 + \sin x} \right) dx$.

(25 points)

Q7. Test for convergence the series $\sum_{n=0}^{\infty} \left(\frac{n^2 + 2^n}{n + 3^n} \right)$. (25 points)

Q8. Test for absolute convergence or conditional convergence or divergence the series

$$\sum_{k=1}^{\infty} (-1)^{k+1} \left(\frac{3^{2k-1}}{k^2 + 1} \right).$$

(20 points)

Q9. Find Taylor's series for the function $f(x) = \frac{1}{x(x-2)}$ at $x = x_0 = 3$. Write first four non-zero terms of the series. (25 points)