

Kuwait University

Dept. of Math. & Comp. Sci.

Math 101. Second Exam, May 13, 1999 Time allowed: 75 min.

Calculators and Mobile Phones are not allowed

Answer the following questions

Q1. (4 pts) Find the following integrals

$$(a) \int \frac{x}{\sin^2(2x^2 - 7)} dx, \quad (b) \int \frac{x^6 + x^2 \cos x - \sqrt{x}}{x^2} dx.$$

Q2. (4 pts) Evaluate the following integrals

$$(a) \int_0^2 (\pi + \sqrt{4 - x^2}) dx, \quad (b) \int_{-\pi}^{\pi} (x^2 - 9 \sin x) dx.$$

Q3. (4 pts) A closed right circular cylinder is to be made to have a volume $16\pi \text{ cm}^3$. If the cost of the material used is 5 cents per cm^2 , and if there is no waste of the material, find the dimensions that will minimize the cost of the material.

Q4. (4 pts) State Rolle's Theorem. If $f(x) = \cos 2x + 2 \cos x$, show that f satisfies the conditions of Rolle's theorem on the interval $[0, 2\pi]$ and find a number $c \in (0, 2\pi)$ that satisfies the conclusion of the theorem.

Q5. (9 pts) Let

$$f(x) = \frac{1}{x^2 - 4} + 3.$$

- Find the intervals on which f is increasing or decreasing, and find the local extrema of f (if any).
- Find the intervals on which the graph of f is concave downward or concave upward, and find the points of inflection (if any).
- Find the horizontal and vertical asymptotes for the graph of f (if any).
- Sketch the graph of f .

(Good Luck)