

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2019

(CUCBCSS—UG)

Mathematics

MAT 5D 19—MATHEMATICS FOR SOCIAL SCIENCES

Time : Two Hours

Maximum : 40 Marks

Section A

Answer all the **six** questions.
Each question carries 1 mark.

1. Solve $\frac{x}{3} - 16 = \frac{x}{12} + 14$.
2. Find the slope m of the linear function passing through $(-1, 15)$ and $(3, 6)$.
3. Find $\lim_{x \rightarrow 2} \sqrt{6x^3 + 1}$.
4. Define concavity and convexity.
5. Find the marginal cost if the total cost function $TC = Q^3 + 7Q + 23$.
6. Test whether the function $f(x) = 3x^3 - 14x + 5$ is increasing or decreasing at $x = 4$.

(6 × 1 = 6 marks)

Section B

Answer any **five** out of seven questions.
Each question carries 2 marks.

7. Solve the quadratic equation $3x^2 - 41x + 26 = 0$.
8. Which of the following equations are functions and why ?

(a) $y = -2x + 7$.

(b) $y^2 = x$.

Turn over

9. Verify whether the function $f(x) = \frac{x^2 + 3x + 12}{x - 3}$ is continuous at $x = 4$.
10. Find the derivative of $y = \frac{4x^3}{1 - 3x}$.
11. If $\log_2 x + \log_4 x + \log_{16} x = \frac{21}{4}$, find x .
12. Evaluate $\int_1^{e^2} \left(\frac{dx}{x(1 + \log_e x)} \right) dx$.
13. A firm's marginal revenue function is $MR = 20e^{-x/10} \left(1 - \frac{x}{10} \right)$. Find the corresponding demand function.

(5 × 2 = 10 marks)

Section C

Answer any **three** out of five questions.

Each question carries 4 marks.

14. If $y = (\log x)^{\log x}$, find $\frac{dy}{dx}$.
15. Evaluate $\lim_{x \rightarrow \infty} \sqrt{\frac{x^2 - 5x}{x^3 + x - 2}}$.
16. Find the cross partial derivatives z_{xy} and z_{yx} for the function $z = x^{0.3} y^{0.5}$.
17. Find the relative extrema for the function $f(x) = -7x^2 + 126x - 23$.
18. Find the marginal revenue function and evaluate them at $Q = 4$ and $Q = 10$ if the demand function is $Q = 36 - 2P$.

(3 × 4 = 12 marks)

Section D

Answer any two out of three questions.
Each question carries 6 marks.

19. Maximize profit π for a firm, given total revenue $R = 4000Q - 33Q^2$ and total cost $C = 2Q^3 - 3Q^2 + 400Q + 5000$.
20. Use integration by parts to integral $\int_1^e x \log_x dx$.
21. Suppose that a firms total cost is given by the function $C = f(q) = 8 + 2q + 0.25q^2$, where C denotes the total cost in dollars and q denotes the total quantity of the good produced. Find the marginal cost of the firm when $q = 10$, and the percentage rate of change of total cost with respect to q when $q = 10$ and interpret the result.

(2 × 6 = 12 marks)