K24FY1315

Reg No:.....
Name :.....

First Semester FYUGP Mathematics Examination
NOVEMBER 2024 (2024 Admission onwards)
KU1DSCCMT101 (COMPUTATIONAL CALCULUS 1)
(DATE OF EXAM: 2-12-2024)

Time : 120 min Maximum Marks : 70

Part A (Answer any 6 questions. Each carries 3 marks)

1. Find $\frac{d}{dx}tanh\sqrt{x}$. 3
2. State Fermat's Theorem. 3
3. Find the critical number of the function $f(x) = 2x^3 + x^2 + 8x$. 3
4. State The First Derivative Test for local extrema. 3
5. State Concavity Test. 3
6. What is Profit Function and Marginal Profit Function? 3
7. Find the most general antiderivative of the function $f(x) = \sqrt[3]{x^2} + x\sqrt{x}$. 3
8. Find f if $f''(x) = 12x^2 + 6x - 4$, $f(0) = 4, f(1) = 1$. 3

Part B (Answer any 4 questions. Each carries 6 marks)

9. Show that if f is differentiable at a then f is continuous at a. 6
10. Show that $sinh^{-1}x = ln(x + \sqrt{x^2 + 1})$. 6
11. Find the absolute maximum and minimum values of the function $f(x) = x - 2sinx, 0 \leq x \leq 2\pi$. 6
12. A farmer has 2400 ft fencing and wants to fence off a rectangular field that border a straight river. He needs no fence along the river. What are the dimensions of the field that has the largest area? 6
13. Find the point on the parabola $y^2 = 2x$ that is closest to the point $(1, 4)$. 6
14. Find f if $f'''(x) = \sqrt[3]{x} - coshx$. 6

Part C (Answer any 2 question(s). Each carries 14 marks)

15. (a) Find the horizontal and vertical asymptotes of $y = \frac{5+4x}{x-3}$. 14
    (b) Find $\lim_{x\to\infty} \sqrt{25x^2 + 2} - 5x$.
16. (a) Find the horizontal asymtotes of the graph of the function. $f(x) = \frac{\sqrt{2x^2+1}}{3x-5}$. 14
    (b) Compute $\lim_{x\to\infty} (\sqrt{x^2 + 1} - x)$.
17. Discuss the curve $y = x^4 - 4x^3$ with respect to concavity, points of inflection. and maxima and minima. 14