

First Semester FYUGP Degree (Reg/Sup) Examination**November 2025****KU1DSCCMT101 - COMPUTATIONAL CALCULUS 1**

2024 Admission onwards

Time : 2 hours

Maximum Marks : 70

Section A**Answer any 6 questions. Each carry 3 marks.**

1. What is Profit Function and Marginal Profit Function?
2. What is Revenue Function and Marginal Revenue Function?
3. State Concavity Test.
4. Compute $\lim_{x \rightarrow 4} \frac{x^2 - 2x - 8}{x - 4}$.
5. Evaluate $\lim_{x \rightarrow \infty} e^x - x$.
6. Find $\frac{d}{dx} e^x \cosh x$.
7. Find $\frac{d}{dx} \cosh 3x$.
8. Find the critical number of $f(x) = x^3 - 3x^2 + 1$.

Section B**Answer any 4 questions. Each carry 6 marks.**

9. Find the local maximum and local minimum values of the function $g(x) = x^3 - 3x^2 - 9x + 4$.
10. If $f'(x) > 0$ on an interval, then show that f is increasing on that interval.
11. Calculate $\lim_{x \rightarrow 0^+} (\tan 2x)^x$.
12. Find an equation of tangent line to the parabola $y = x^2 - 8x + 9$ at the point $(3, -6)$.
13. Prove that $\tan^{-1}x + \cot^{-1}x = \frac{\pi}{2}$.
14. Find the absolute maximum and minimum values of the function $12 - 4x - x^2$, in $[0, 5]$.

Section C

Answer any 2 questions. Each carry 14 marks.

15. (a) Find the horizontal and vertical asymptotes of $y = \frac{5-4x}{x+3}$.
(b) Find $\lim_{x \rightarrow \infty} \sqrt{25x^2 + 2} - 5x$.
16. (a) Find the horizontal asymptotes of the graph of the function. $f(x) = \frac{\sqrt{2x^2+1}}{3x-5}$.
(b) Compute $\lim_{x \rightarrow \infty} (\sqrt{x^2+1} - x)$.
17. (a) A woman launches her boat from point A on a bank of a straight river, 3 km wide, and wants to reach point B, 8 km downstream on the opposite bank, as quickly as possible. She could row her boat directly across the river to point C and then run to B, or she could row directly to B, or she could row to some point D between C and B and then run to B. If she can row 6 km/h and run 8 km/h, where should she land to reach B as soon as possible? (We assume that the speed of the water is negligible compared with the speed at which the woman rows.)
(b) Find the most general antiderivative of $f(x) = \frac{1}{1+x^2} + \sqrt[3]{x^4}$.