QP Code: U25DRIS046

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

ST MARY'S COLLEGE (AUTONOMOUS), THRISSUR-20

I SEMESTER (FYUGP) DEGREE EXAMINATIONS, NOVEMBER 2025
(Regular/Improvement/Supplementary)
MAT1MN103 : Basic Calculus
2024 Admission Onwards
(Credits: 4)

Time: 2 Hours **Maximum Marks: 70**

Section A

*Answer **all**. Each question carries **3** Marks.* ***(Ceiling: 24 Marks)***

1. If $f(x) = 3x - 2$, find$f(0)$, $f(5)$ and $f(6)$.
2. If $\lim_{x \longrightarrow c} f(x) = 16$. Find $\lim_{x \longrightarrow c}[f(x)]^2$ and $\lim_{x \longrightarrow c} \sqrt{f(x)}$
3. Find $\lim_{x \to 2} 3x + 2$.
4. Find the derivative of $f(x) = (x^3 + 4x)(3x^2 + 2x - 5)$
5. State the Intermediate Value theorem.
6. Find the derivative of $y = \dfrac{\sin x}{2}$
7. Explain concavity of a function.
8. Define relative maximum and relative minimum of a function.
9. State the Second Fundamental theorem of calculus.
10. Find the general solution of the differential equation $\dfrac{dy}{dx} = 2$.

Section B

*Answer **all**. Each question carries **6** Marks* ***(Ceiling: 36 Marks)***

11. Prove that the limit $\lim_{x \longrightarrow 0} \dfrac{|x|}{x}$ does not exist.
12. Which of the following functions has an inverse function. Explain.
    i) $f(x) = x^3 - 1$
    ii) $f(x) = x^3 - x - 1$
13. Differentiate $f(x) = \ln \dfrac{x(x^2+1)^2}{\sqrt{2x^3 - 1}}$.

Turn Over

14. Find the slope of the graph of $f(x) = \dfrac{8}{x^2}$ at the point (2,2).

15. Determine the extrema of $f(x) = 2\sin x - \cos 2x$ on the interval $[0, 2\pi]$.

16. Determine the points of inflection and concavity of the graph of $f(x) = x^4 - 4x^3$.

17. Find the particular solution of the differential equation that satisfies the initial condition $f'(x) = 6x$, $f(0) = 8$.

18. Evaluate $\int_0^2 |2x - 1| dx$.

Section C

*Answer **any one**. Each question carries **10** Marks* ***(1x10=10marks)***

19. Find the following limits,

1) $\lim_{x\to 4} \dfrac{x-4}{x^2-16}$.

2) $\lim_{x\to 3} \dfrac{\sqrt{x+1}-2}{x-3}$.

20. 1) State and prove Mean value theorem.

2) Find critical numbers of the function $f(x) = 8x^2 - 4x$.

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