QP Code:U24A050

Reg. No : .....

Name : .....

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

I SEMESTER B.A./B.Sc./B.Com/BSW (FYUGP) DEGREE EXAMINATION, November 2024

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. Find the domain and range of the function, $f(x) = \frac{3}{x}$. [BTL2]
2. Find $\lim_{x \to -4}(\frac{1}{2}x - 1)$. [BTL1]
3. If $f(x) = 5 - x$ and $g(x) = x^2$. Find $\lim_{x \to 1} g(f(x))$. [BTL4]
4. Find the derivative of $y = \cos x - \frac{\pi}{3}\sin x$. [BTL3]
5. Describe the continuity of the function $y = \sin x$. [BTL4]
6. Find the derivative of $y = \dfrac{5x - 2}{x^2 + 1}$. [BTL2]
7. Define absolute maximum and absolute minimum of a function. [BTL3]
8. Explain point of inflection of a function. [BTL2]
9. Find $\int \dfrac{\sin x}{\cos^2 x} dx$. [BTL3]
10. State the Fundamental theorem of calculus. [BTL1]

Section B

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

11. Show that the functions $f(x) = 5x + 1$ and $g(x) = \frac{x-1}{5}$ are inverse functions of each other. [BTL1]
12. Explain the existence of $\lim_{x \to 0} \frac{1}{x^2}$. [BTL5]
13. Find the slope of the graph of $f(x) = x^4$ for each value of x. [BTL1]
    i) $x = -1$
    ii) $x = 0$
    iii) $x = 1$

Turn Over

14. Find the derivative of $y = \dfrac{(x-2)^2}{\sqrt{x^2+1}}, x \neq 2.$ [BTL5]

15. Find the extrema of $f(x) = 3x^4 - 4x^3$ on the interval [-1,2]. [BTL1]

16. Find the open intervals on which $f(x) = x^3 - \frac{3}{2}x^2$ is increasing or decreasing. [BTL3]

17. Find the particular solution of the differential equation that satisfies the initial condition $h'(x) = e^x, h(0) = 4.$ [BTL3]

18. Evaluate the function $f(x) = \int_0^x \cos t dt$ at $x = 0, \pi/6, \pi/4, \pi/3$ and $\pi/2.$ [BTL5]

Section C

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

19. Find the following limits. [BTL4]

    i) $\lim_{x \to 0} \dfrac{\sqrt{x+1}-1}{x}.$

    ii) $\lim_{x \to 0} \dfrac{x}{x^2 - x}.$

20. i) State and prove Mean value theorem. [BTL5]

    ii) Find all critical points of the function $g(x) = x - \sqrt{x}.$

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