

Model Question paper
Differential Calculus 3

11th Standard

Maths

Reg.No. :

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I. Answer all the questions.

II. Use blue pen only.

Time : 02:00:00 Hrs

Total Marks : 60

10 x 1 = 10

Part - A

- 1) The left limit as $x \rightarrow 1$ of $f(x) = -x + 3$ is
(a) 2 (b) 3 (c) 4 (d) -4
- 2) $\lim_{x \rightarrow \infty} \left(1 - \frac{1}{x}\right)^x$ is
(a) e (b) -e (c) $\frac{1}{e}$ (d) 0
- 3) $f(x) = |x| + |x-1|$ is
(a) continuous at $x=0$ only (b) continuous at both $x=0$ and $x=1$ (c) continuous at both $x=0$ and $x=1$ (d) discontinuous at $x=0, 1$
- 4) $R f'(0)$ for the function $f(x) = \begin{cases} 0, & x \leq 0 \\ x, & x > 0 \end{cases}$ is
(a) 1 (b) 0 (c) -1 (d) 2
- 5) The derivative of $f(x) = x^2|x|$ at $x=0$ is
(a) 0 (b) -1 (c) -2 (d) 1
- 6) $\lim_{x \rightarrow 2} 2 \frac{x^3 - 3x + 2}{x^2 - x - 2}$ is
(a) $-\frac{1}{3}$ (b) 3 (c) $\frac{1}{3}$ (d) -3
- 7) $\lim_{x \rightarrow \infty} \frac{1}{x^2}$ is
(a) ∞ (b) 0 (c) $-\infty$ (d) 1
- 8) $\frac{d}{dx}(3^x + e^{a \log a})$ is
(a) $3^x \log 3$ (b) $3^x a^a$ (c) $3^x \log 3 \cdot e^{a \log a}$ (d) $\frac{1}{3x}$
- 9) If $y = 3x^3 + x^2 + 1$, then $\frac{d^3y}{dx^3}$ is
(a) $18x + 2$ (b) 18 (c) 2 (d) $9x^2 + 2x$
- 10) If $y = 5e^x - 3 \log x$, then $\frac{d^2y}{dx^2}$ is
(a) $5e^x - \frac{3}{x}$ (b) $5e^x + \frac{3}{x^2}$ (c) $5e^x - \frac{3}{x^2}$ (d) $5e^x + \frac{3}{x}$

Part - B

5 x 2 = 10

- 11) Find the Indicated limits $\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^{n+5}$
- 12) Without using the series expansion of $\log(1+x)$, prove that $\lim_{x \rightarrow 0} \frac{\log(1+x)}{x} = 1$
- 13) If $y = \log(x^2 - a^2)$ prove that $y_3 = 2 \left[\frac{1}{(x+a)^3} + \frac{1}{(x-a)^3} \right]$
- 14) Differentiate $\frac{e^{bx}}{\cos(ax+b)}$
- 15) Given $y = (3x-7)(3x^2-4)$ find $\frac{dy}{dx}$

Part - C

5 x 3 = 15

- 16) Find dy/dx if x and y are connected parametrically by the equations (without eliminating the parameter).
 $x = at^2, y = 2at$
- 17) Find dy/dx if x and y are connected parametrically by the equations (without eliminating the parameter).
 $x = a \left(\cos \theta + \log \tan \frac{\theta}{2} \right), y = a \sin \theta$
- 18) Let f be defined by $f(x) = \begin{cases} \frac{x^2}{2}, & 0 \leq x \leq 1 \\ 2x^2 - 3x + \frac{3}{2}, & 1 < x \leq 2 \end{cases}$ show that f is continuous at $x=1$.

- 19) Differentiate $(a - b \sin x)(1 - 2 \cos x)$
- 20) A function f is defined on by $f(x) = \begin{cases} -x^2 & \text{if } x \leq 0 \\ 5x - 4 & \text{if } 0 < x \leq 1 \\ 4x^2 - 3x & \text{if } 1 < x < 2 \\ 3x + 4 & \text{if } x \geq 2 \end{cases}$ Examine f for continuity at $x=0, 1, 2$.

Part - D

5 x 5 = 25

21) Differentiate the following functions w.r. to x.

$$\frac{\sin x \cos(e^x)}{e^x + \log x}$$

22) Evaluate $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - \sqrt{1-x}}{\sin^{-1} x}$

23) Find $\frac{dy}{dx}$ if $y = \cos^{-1}\left(\frac{1-x}{1+x}\right)$

24) Differentiate $\tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right)$

25) If $y = \sin(ax + b)$, prove that $y_3 = a^3 \sin\left(ax + b + \frac{3\pi}{2}\right)$

