

Model Question Paper
Differential Calculus Part I - Part I

12th Standard

Maths

Reg.No. :

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I. Answer all questions.

II. Use blue pen only.

Time : 01:30:00 Hrs

Total Marks : 85

3 x 1 = 3

Section-A

- 1) The gradient of the curve $y = -2x^3 + 3x + 5$ at $x = 2$ is
(a) -20 (b) 27 (c) -16 (d) -21
- 2) The rate of change of area A of a circle of radius r is
(a) $2\pi r$ (b) $2\pi r \frac{dr}{dt}$ (c) $\pi r^2 \frac{dr}{dt}$ (d) $\pi \frac{dr}{dt}$
- 3) The velocity v of a particle moving along a straight line when at a distance x from the origin is given by $a + bv^2 = x^2$ where a and b are constants. Then the acceleration is
(a) $\frac{b}{x}$ (b) $\frac{a}{x}$ (c) $\frac{x}{b}$ (d) $\frac{x}{a}$

Section-B

3 x 3 = 9

- 4) The luminous intensity I candelas of a lamp at varying voltage V is given by : $I = 4 \times 10^{-4} V^2$ Determine the voltage at which the light is increasing at a rate of 0.6 candelas per volt.
- 5) Verify Rolle's theorem for the following: $f(x) = x(x-1)(x-2)$, $0 \leq x \leq 2$
- 6) Verify Rolle's theorem for the following functions: $f(x) = 4x^3 - 9x$, $-\frac{3}{2} \leq x \leq \frac{3}{2}$

Section-C

5 x 6 = 30

- 7) Find the equations of the tangents and normal to the curve $y = x^3$ at the point (1,1).
- 8) Find the equations of the tangent and normal to the curve $y = x^2 - x - 2$ at the point (1, -2).
- 9) Find the equation of the tangent at the point (a,b) to the curve $xy = c^2$.
- 10) Find the equation of the tangent to the parabola, $y^2 = 20x$ which forms an angle 45° with the x-axis.
- 11) Verify Rolle's theorem for the following: $f(x) = e^x \sin x$, $0 \leq x \leq \pi$

Section-D

5 x 10 = 50

- 12) Find the equations of the tangent and normal at $\theta = \frac{\pi}{2}$ to the curve $x = a(\theta + \sin\theta)$, $y = a(1 + \cos\theta)$.
- 13) Find the equations of tangent and normal to the curve $16x^2 + 9y^2 = 144$ at (x_1, y_1) where $x_1 = 2$ and $y_1 > 0$.
- 14) Find the equations of the tangent and normal to the ellipse $x = a \cos\theta$, $y = b \sin\theta$ at the point $\theta = \frac{\pi}{4}$.
- 15) a) Find the angle between the curves $y = x^2$ and $y = (x-2)^2$ at the point of intersection.

(OR)

- b) Find the condition for the curves $ax^2 + by^2 = 1$, $a_1x^2 + b_1y^2 = 1$ to intersect orthogonally.
