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Course Title : Differential Calculus
and Coordinate Geometry

Course Code : MAT-115

①

Answer to the Question No-1

$$① y = e^{3x+2}$$

$$\begin{aligned} y_1 &= \frac{dy}{dx} = e^{3x+2} \frac{d}{dx} (3x+2) \\ &= e^{3x+2} (3 \cdot 1 + 0) \\ &= 3e^{3x+2} \end{aligned}$$

$$\begin{aligned} y_2 &= \frac{d^2y}{dx^2} = 3 \left[\frac{d}{dx} (e^{3x+2}) \right] \\ &= 3 [3e^{3x+2}] \\ &= 9e^{3x+2} \\ &= 9y \quad (\text{Ans.}) \end{aligned}$$

$$② y = \log x + ax$$

$$\frac{dy}{dx} = \frac{1}{x} + a$$

$$\therefore y_1 = \frac{1}{x} + a$$

$$\begin{aligned} \frac{d^2y}{dx^2} &= \frac{d}{dx} \left(\frac{1}{x} + a \right) \\ &= \frac{-1}{x^2} \end{aligned}$$

$$y_2 = -\frac{1}{x^2} \quad (\text{Ans.})$$

②

Answer to the Question No - 2

$$f(x) = 3x^2 - 2x + 4$$

$$f'(x) = \frac{d}{dx}(3x^2) - \frac{d}{dx}(2x) + \frac{d}{dx}4$$
$$= 3x^2 - 2$$

at, $x=0$ slope

$$m = f'(0) = 3 \cdot 0^2 - 2$$
$$= -2$$

$$f(0) = 3 \cdot 0^2 - 2 \cdot 0 + 4$$

So the point is $(0, 4)$

So the equation is

$$y - y_0 = m(x - x_0) \quad \left[\begin{array}{l} m = -2 \\ x = 0 \\ y = 4 \end{array} \right]$$

$$y - 4 = -2(x - 0)$$

$$\Rightarrow y = -2x - 4$$

3

Answer to the Question No-4

$$y = x^2 - 2x + 3$$

$$\Rightarrow \frac{dy}{dx} = 2x - 2$$

Now,

$$2x - 2 = 0$$

$$\Rightarrow 2x = 2$$

$$x = 1.$$

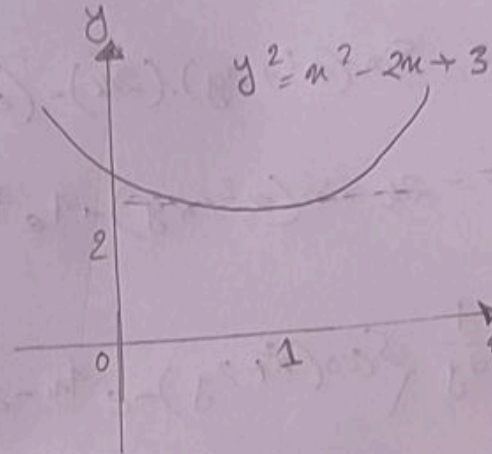
put $x = 1$ of y

$$y = 1^2 - 2 \cdot 1 + 3$$

$$= 1 - 2 + 3$$

$$= 2$$

$$\therefore (x, y) = (1, 2) \text{ (Ans.)}$$



④

Answer to the Question 10-5

$$w = \cos(x^2 + 2y) - e^{4x - z^4 y} + 3$$

$$\frac{\partial w}{\partial x} = \frac{d}{dx} \left\{ \cos(x^2 + 2y) - e^{4x - z^4 y} + y^3 \right\}$$

$$= -\sin(x^2 + 2y) \cdot (2x) - (e^{4x - z^4 y}) \cdot 4$$

$$= -2x \sin(x^2 + 2y) - 4e^{4x - z^4 y}$$

$$\frac{\partial w}{\partial y} = \frac{d}{dy} \left\{ \cos(x^2 + 2y) - e^{4x - z^4 y} + y^3 \right\}$$

$$= -\sin(x^2 + 2y) \cdot 2 + 3y^2$$

$$= -2\sin(x^2 + 2y) + 3y^2$$

$$\frac{\partial w}{\partial z} = -4z^3 y e^{(4x - z^4 y)}$$