Victoria University of Bangladesh
Dept. of CSE Program:- B.Sc. in CSIT
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Ans to the Q no (1)

(i) $y = e^{3x+2}$

$$y_1 = \frac{dy}{dx} = e^{3x+2} \frac{d}{dx}(3x+2)$$

$$= e^{3x+2}(3.1+0)$$

$$= 3e^{3x+2}$$

$$y_2 = \frac{y_2 y}{dx} = 3\left[\frac{d}{dx}(e^{3x+2})\right]$$

$$= 3(3e^{3x+2})$$

$$= 9e^{3x+2}$$

$$= 9y \text{ (Ans)}$$

(ii) $y = \log x + ax$

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

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

$$\frac{y_2 y}{dx^2} = \frac{d}{dx}\left(\frac{1}{x} + a\right)$$

$$= \frac{1}{x^2}$$

$$y^2 = -\frac{1}{x^2} \text{ (Ans)}$$

Ans to the Q no-(2)

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

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

$= 3x^2 - 2$

at, $x = 0$ slope

$m = f'(0) = 3.0 - 2$

$= -2$

$f(0) = 3.0 - 2.0 + 4$

So, the point is $(0, 4)$

So the equation is —

$y - y_0 = m(x - x_0)$

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

$\Rightarrow y = -2x - 4$

$m = -2$
$x = 0$
$y = 4$

Ans to the Q. no - ③

To find the 2nd order differential equation for 'y' with respect to 'x' will first differentiate the given equation with respect to 'x' multiple time.

Given equation,

$$\frac{d^2y}{dx^2} + 3\frac{d^2y}{dx} - 4y = xe^x$$

Lets differentiate Ans by Acp.

Take the first derivative of both sides with respect x!

x:-

$$\frac{d}{dx}\left(\frac{d^2y}{dx^2}\right) + \frac{d}{dx}\left(3\frac{dy}{dx}\right) - \frac{d}{dx}(4y) = \frac{d}{dx}(x.e^x)$$

$$\Rightarrow \frac{d}{dx}\left(\frac{d^2y}{dx^2}\right) + 3\frac{d}{dx}\left(\frac{dy}{dx}\right) - 4\frac{dy}{dx} = e^x + xe^x$$

$$\Rightarrow \frac{d^2}{dx^2}\left(\frac{dy}{dx}\right) + 3\frac{d^2}{dx^2}\left(\frac{dy}{dx}\right) - 4\frac{d^2y}{dx^2} = e^x + xe^x$$

$$\Rightarrow \frac{d^4y}{dx^4} + 3\frac{d^3y}{dx^3} - 4\frac{d^2y}{dx^2} = e^x + xe^x$$

So the second order differential equation for y with respect to x. is:-

$$\frac{d^4y}{dx^4} + 3\frac{d^3y}{dx^3} - 4\frac{d^2y}{dx^2} = e^x + xe^x. \quad \text{(Ans.}$$

Ans to the Q no - ④

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

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

Now, $2x - 2 = 0$

$x = 1$

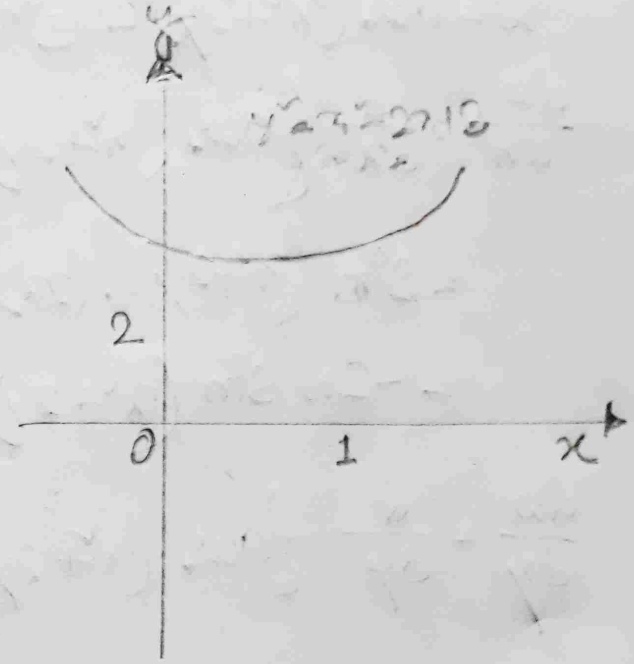
put $x = 1$ at y

$y = 1^2 - 2.1 + 3$

$= 1 - 2 + 3$

$= 2$

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



Ans to the Q no - (5)

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

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

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

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

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

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

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

$$\frac{dw}{yz} = 4z^3y\, e^{(4x - z^4y)}$$

(Ans)