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Course code: MAT-325
Course Title: Differential Equation and Furrier Analysis.
Batch: 08 (evening)

Ans: to the Q. NO: 01

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

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

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

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

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

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

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

$= 9y$ Ans!

(2) Ans:

$y = \log x + ax$

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

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

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

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

$\therefore y_2 = -\frac{1}{x^2}$ ans

Ans: All: Q: No: 02

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

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

$= 3x^2 - 2$

at, $x = 0$ slope

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

$= -2$

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

So the point is $(0, 4)$

P.T.O

So the equation is -

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

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

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

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

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Ans: to the Q: NO: 4

Ans:

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

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

Now, $2x - 2 = 0$

$x = 1$

Put, $x = 1$ at y

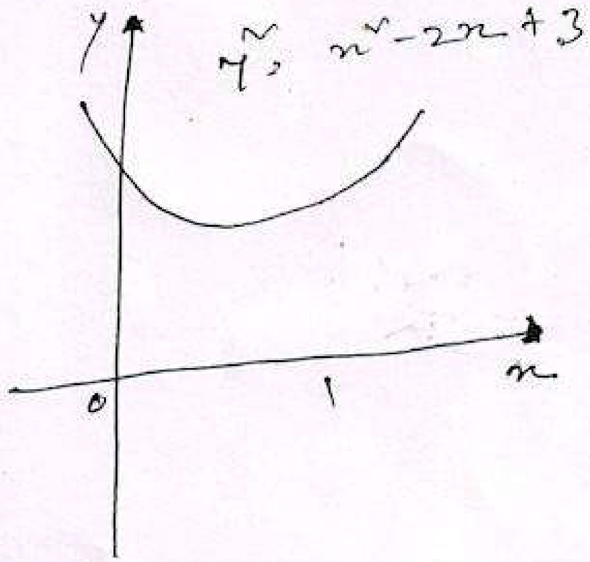
$y = 1^2 - 2\cdot1 + 3$

$= 1 - 2 + 3$

$= 2$

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

Ans



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Ans: to : Q: No No: 03

finding the second order differential equation for y' with the respect to 'x' will first differentiate the given equation with respect to 'x' multiple time.

Given equation:

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

① Take other first derivative of both sides with respect x:-

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

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

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

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

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

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

Ans: to: the: Q: No. 5

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

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

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

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

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

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

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

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

Ans: