# Quiz - 02

Name : Mosnoor Mofiz Arman

ID : 1921079642

Course : MAT120

Section : 11

Date : 03-03-2022.

## Ans to the Q NO: 02

Given,

$x \neq 0$ and $y = \frac{1}{x}$.

Now,

$$y = \frac{1}{x}$$

$$\therefore y' = \frac{d}{dx}\left(\frac{1}{x}\right) = \frac{d}{dx}(x^{-1}) = (-1)x^{-1-1} = -x^{-2}$$

$$\therefore y'' = \frac{d}{dx}(-x^{-2}) = -(-2)x^{-2-1} = 2x^{-3}$$

L.H.S $= x^3 y'' + x^2 y' - xy$

$$= x^3.(2x^{-3}) + x^2(-x^{-2}) - x.\frac{1}{x}$$

$$= 2.x^{3-3} - x^{2-2} - 1$$

$$= 2.x^0 - x^0 - 1$$

$$= 2.1 - 1 - 1 = 2 - 1 - 1 = 0 = \text{R.H.S}$$

$$\therefore x^3 y'' + x^2 y' - xy = 0$$

(showed)

# Ans to the Q NO: 03

Given,

$$f(x) = \left(\frac{1}{x} - \frac{1}{x^2}\right)(x^2+8).$$

$$\therefore f'(x) = (x^2+8)\frac{d}{dx}\left(\frac{1}{x} - \frac{1}{x^2}\right) + \left(\frac{1}{x} - \frac{1}{x^2}\right)\frac{d}{dx}(x^2+8)$$

$$= (x^2+8)\frac{d}{dx}(x^{-1} - x^{-2}) + (x^{-1} - x^{-2})\frac{d}{dx}(x^2+8).$$

$$= (x^2+8)\left[(-1)x^{-2} - (-2)x^{-3}\right] + (x^{-1} - x^{-2})(2x+0).$$

$$= (x^2+8)(-x^{-2} + 2x^{-3}) + (x^{-1} - x^{-2})(2x).$$

$$= -x^0 - 8x^{-2} + 2x^{-1} + 16x^{-3} + 2x^0 - 2x^{-1}$$

$$= -1 - 8x^{-2} + 2x^{-1} + 16x^{-3} + 2 - 2x^{-1}$$

$$= 16x^{-3} - 8x^{-2} + 1.$$

(Ans).

# Ans to the QNO: 01

Given,

$$f(x) = x^2 - 2x$$

The derivative with respect to $x$,

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{h \to 0} \frac{(x+h)^2 - 2(x+h) - (x^2 - 2x)}{h}$$

$$= \lim_{h \to 0} \frac{x^2 + 2xh + h^2 - 2x - 2h - x^2 + 2x}{h}$$

$$= \lim_{h \to 0} \frac{2xh + h^2 - 2h}{h}$$

$$= \lim_{h \to 0} \frac{h(2x + h - 2)}{h}$$

$$= \lim_{h \to 0} (2x + h - 2)$$

$$= 2x + 0 - 2 = 2x - 2$$ (Ans).