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Matric no:- 19/[illegible]

1) $y = \frac{1}{x-2}$
the function is defined for all real numbers except $x = 2$, the domain is the set of real numbers except $x = 2$, the codomain of the set of real numbers except $y = 0$

2) $y = \ln x$

$\frac{dy}{dx} = \frac{1}{x}$ //

3) a) $2x - 3y - 2 = 0$

$-3y = 2 - 2x$

$y = \frac{2-2x}{-3}$

$y = \frac{2x+2}{3} = \frac{2(x+1)}{3}$ //

b) $x^2 + y^2 = 4$

$y^2 = 4 - x^2$

$y = \pm\sqrt{4-x^2}$ //

4) Find dp/dt, $p = \sin^{-1} t$

$p = \frac{t}{\sin}$; $t = \sin p$

$\frac{dt}{dp} = \cos p$; $\frac{dp}{dt} = \frac{1}{\cos p}$

Recall, $\cos^2 y + \sin^2 y = 1$

$\cos y = \pm\sqrt{1 + \sin^2 y}$

$t = \sin p$

$\therefore \cos p = \sqrt{1-t^2}$

Hence $dp/dt = 1/(1-t^2)$ //

5) $F(x) = 2x^2 - 5$; $g(x) = 4x - 2$

$Fog(x) = 2(4x-2)^2 - 5$

$= 2(16x^2 - 16x + 4) - 5$

$= 32x^2 - 32x + 8 - 5$

$= 32x^2 - 32x + 3$

$goF(x) = 4(2x^2 - 5) - 2$

$= 8x^2 - 20 - 2$

$= 8x^2 - 22$ //

Math [illegible]

6) Show that $F(x) = Fe(x) + Fo(x)$

$F(x) = 3x^2 - 2x + 1$

$Fe(x) = \frac{F(x) + F(-x)}{2}$

$F(-x) = 3(-x)^2 - 2(-x) + 1$

$= 3x^2 + 2x + 1$

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

$= \frac{6x^2 + 2}{2} = 3x^2 + 1$

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

$= -4x/2 = -2x$

$Fe(x) + Fo(x) = 3x^2 + 1 - 2x$

$= 3x^2 - 2x + 1$ //

7) Differentiate $y = \cos x$

$y + \delta y = \cos(x + \delta x)$

$\delta y = \cos(x + \delta x) - \cos x \ (y = \cos x)$

Recall

$\cos(A+B) - \cos(A-B) = -2\sin A \sin B$ - (2)

Comparing (1) & (2)

$A + B = x + \delta x$ - (3)

$A - B = x$ - (4)

Adding (3) & (4) & subtracting (3) & (4)

$2A = 2x + \delta x$ & $B = \delta x/2$

$A = x + \delta x/2$

Comparing 1 & 2

$\delta y = \cos(\delta x) - \cos x$

$= 2\sin(x + \delta x/2) \sin(\delta x/2)$

Dividing through by δx

$\frac{\delta y}{\delta x} = \frac{-2\sin(x + \delta x/2)\sin(\delta x/2)}{\delta x}$

$\frac{\delta y}{\delta x} = \frac{-\sin(x + \delta x/2)\sin(\delta x/2)}{\delta x/2}$

$= -\sin(x + \delta x/2) \times \frac{\sin(\delta x/2)}{\delta x/2}$

Taking limit $\delta x \to 0$

$\lim_{\delta x \to} \frac{\sin \delta x/2}{\delta x} = 1$

$\delta y/\delta x = -\sin x$ //

$F(x) = f_e(x) + f_o(x)$

$x+1$

$f(-x)$

$2(-x)+1$

1

$(2x^2+2x+1)$

$(3x^2+1)$

(x^2+2x+1)

x

//

x

$x\ (y = \cos x)$

$2\sin A \sin B - (2)$

ding (3) & (4)

)

8) $y = 3t^2 \ ; \ x = 1/t^2$

$$\frac{dy}{dx} = \frac{dy}{dt} \times \frac{dt}{dx}$$

$$= \frac{dy}{dt} \div \frac{dx}{dt}$$

$$\frac{dy}{dt} = 6t \ ; \ \frac{dx}{dt} = \frac{-2}{t^3}$$

$$\frac{dy}{dx} = 6t \div \frac{-2}{t^3}$$

$$= 6t \times \frac{-2}{t^3} = \frac{6t-2}{t^2} = \frac{-12}{t^2}$$

$$dy/dx = \frac{-12}{t^2}$$

9) $y = x^2 \cos 2x \, e^{4x}$

situation

taking $\log_e$ of both sides $\ln y = \ln x^2 + \ln \cos 2x + \ln e^{4x}$. differentiating both wrt x $\frac{1}{y}\frac{dy}{dx} = \frac{1}{x^2}(2x) + \frac{1(-2\sin 2x)}{\cos 2x} + 4$

$$\frac{1}{y}\frac{dy}{dx} = \frac{2}{x} = \frac{2\sin 2x}{\cos 2x} + 4$$

multiplying both sides by y

~~10) y = sin (3x^2~~ $\frac{dy}{dx} = y\left(\frac{2}{x} - \frac{2\sin 2x}{\cos 2x} + 4\right)$

$$= x^2 \cos 2x \, e^{4x} \times \frac{2}{x} - \frac{2\sin x}{\cos x} + 4$$ //

10) $y = \sin(3x^3 + 5)$

let $u = 3x^3 + 5$

$$\frac{dy}{du} = \cos u$$

$$\frac{du}{dx} = 9x^2$$

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

$$= \cos u \times 9x^2$$