MAT 104 Assignment

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DEPARTMENT : PHARMACY

MATRIC NO: 19/MHS11/128

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 / the ~~set of~~ real number $y = 0$

2. $k = \ln V$

$\frac{dk}{dv} = \frac{1}{v}$

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

$-3y = 2 - 2x$

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

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

b. $x^2 + y^2 = 1$

$y^2 = 1 - x^2$

$y = \pm\sqrt{1 - x^2}$

4. Find dP/dt; $P = \sin^{-1} t$

$P = t$; $t = \sin P$

$\sin$

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

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

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

$t = \sin P$

$\therefore \cos P = \sqrt{1 + t^2}$

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

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

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

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

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

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

6. Show that $f(x) = f_2(x) + f_0(x)$

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

$f_e(x) = \frac{f(x) + f(-x)}{2}$

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

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

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

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

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

$= \frac{-4x}{2} = -2x$

$f_e(x) + f_o(x) = 3x^2 + 1 - 2x$

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

7. Differentiate $y = \cos x$

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

$\delta y = \cos(x + \delta x) - \cos x$ — ①

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 ④ & ③

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

$A = \frac{2x + \delta x}{2}$

$A = x + \frac{\delta x}{2}$

Comparing ① & ②

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

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

Dividing through by δx

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

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

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

Taking Limit $\delta x \to 0$

$\lim_{\delta x \to 0} \frac{\sin \frac{\delta x}{2}}{\delta x/2} = 1$

$\frac{\delta y}{\delta x} = -\sin\left(x + \frac{\delta x}{2}\right) \times 1$

$\lim_{\delta x \to 0}$

$\frac{\delta y}{\delta x} = -\sin x$

8. $y = 3t^2$; $x = \frac{1}{t^2}$

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

$= dy/dt \div dx/dt$

$dy/dt = 6t$; $dx/dt = -2/t^3$

$dy/dx = 6t \div -2/t^3$

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

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

$dy/dx = -12/t^2$

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

Taking Loge of both sides

$\ln y = \ln x^2 + \ln \cos 2x + \ln e^{4x}$

Differentiating both w.r.t x

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

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

multiplying both sides by "y"

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

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

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

Let $u = 3x^3 + 5$

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

$dy/dx = 9x^2$

$dy/dx = dy/du \times du/dx$

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

$= 9x^2 \cos u$

$= 9x^2 \cos 3x^3 + 5$