NAME: Ezimora Emmanuel Uchenna
DEPT: Pharmacy
COLLEGE: Medicine and Health science
MATRIC NO: 19/MHS11/062

MATHS ASSIGNMENT

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 is the set of real numbers except $y=0$

2) $K = \ln v$

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

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

$-3y = 2 - 2x$

$y = 2 - 2x/-3$

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

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

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

$y = 4 - x^2$

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

4) Find $\frac{dP}{dt}$, $P = \sin^{-1} t$ $P = \frac{1}{\sin}$

$t = \sin P = x$

$\frac{dt}{dP} = \cos P$, $\frac{dP}{dt} = \frac{1}{\cos P}$

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 $dP/dt = \frac{1}{(1-t^2)}$

5) $f(x) = 2x^2 - 5$, $g(x) = 4x - 2$

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

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

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

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

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

$= 8x^2 - 20 - 2$

$= 8x^2 - 22$

6) Show that $f(x) = fe(x) + fo(x)$

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

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

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

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

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

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

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

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

$fe(x) + fo(x) = 3x^2 + 1 - 2x$

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

7) Differentiate $y = \cos x$

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

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

$(y = \cos x)$

Recall,

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

Comparing ① and ②

$A + B = x + \delta x$ — ③

$A - B = x$ — ④

Adding ③ and ④ and subtracting ③ & ④

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

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

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

Comparing ① & ②

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

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

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 $\delta x \longrightarrow 0$

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

$$\frac{\delta y}{\delta x} = -\sin(x + 0/2) \times 1$$

$\lim \delta x \longrightarrow 0$

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

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

$dy/dx = dy/dx \times dt/dx$

$= dy/dt \div dx/dt$

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

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

$= 6t \times -2/t^3 = \frac{6\times-2}{t^2}\frac{5/12}{t^2}$

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

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

solution

Taking $\log_e$ of both sides

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

Differentiating both wrt x

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

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

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 $u = 3x^3 + 5$

$$\frac{dy}{dx} = \cos x$$

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

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

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

$= 9x^2 \cos x$

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