Busari Abdulmumeen
19/MHS11/042
Pharmacy
MAT 104

(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) $K = \ln V$

$\frac{dK}{dV} = \frac{1}{V}$

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

$-3y = 2 - 2x$

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

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

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

$y^2 = 4 - x^2$

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

(4) Find dP/dt $P = \sin^{-1}$

$P = \frac{t}{\sin}$; $t = \sin P$ — *

$dt/dP = \cos P$; $dP/dt = 1/\cos P$

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

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

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

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

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

$= 8x^2 - 20 - 2$

$= 8x^2 - 22$

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

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

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

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

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

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

$f_e x + f_0(x) = 3x^2 + 1 - 2x$

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

(7) Differentiate $y = \cos x$

$y + dy = \cos(x + dx)$

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

Recall

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

Comparing (1) & (2)

$A + B = x + dx$ — (3)

$A - B = x$ — (4)

Adding (3) & (4) & Subtracting (3) & (4)

$2A = 2x + dx$ & $B = dx/2$

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

$A = x + dx/2$

Comparing (1) & (2)

$dy = \cos - \cos x$

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

Dividing through by dx

$\cancel{\frac{dy}{dx} = \frac{-2\sin(x + dx/2)}{\sin(dx/2)}}$

$$\frac{dy}{dx} = \frac{-2\sin(x + dx/2)\sin(dx/2)}{dx}$$

$$\frac{dy}{dx} = \frac{-\sin(x + dx/2)\sin(dx/2)}{dx/2}$$

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

Taking limits $dx \to 0$

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

$dy/dx = -\sin(x + 0/2) \times 1$

$\lim_{dx \to 0}$

$dy/dx = -\sin x$

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

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

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

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

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

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

$$= \frac{2}{t^2}$$

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

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

log 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

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

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

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

let $u = 3x^3 + 5$

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

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

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

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

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

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