(6)

$f(x) = 3x^2 - 2x + 1 = 0$, Show that $f_e(x) + f_o(x) = f$

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

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

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

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

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

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

$\therefore f_e(x) = 3x^2 + 1$

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

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

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

$\therefore f(x) = f_e(x) + f_o(x)$

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

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

7) $y = \cos x$ from 1st Principle

$y = \cos x$

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

Subtract y from both sides

$\delta y = \cos(x + \cancel{\delta y}^{\,\delta x}) - y$

but $y = \cos x$

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

Consider from trignometry

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

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

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

Compare (1) and (2)

let $A + B = x + \delta x$ ---- (i)

$A - B = x$ ----- (ii)

adding (i) and (ii)

$2A = 2x + \delta x$

$A = \frac{2x + \delta x}{2} \Rightarrow A = x + \frac{\delta x}{2}$ --- (3)

Substitute equ (3) in equ (2)

$x + \frac{\delta x}{2} - B = x$

$B = \frac{\delta x}{2}$

Compare Eqn (1) and (2)

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

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

$$\delta y/\delta x = -\sin(x + \frac{\delta x}{2}) \frac{\sin(\delta x/2)}{\delta x/2}$$ --- (4)

A standard limit

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

find limit of 4 as $\delta x \to 0$

$$\lim_{\to 0} \frac{\delta y}{\delta x} = \lim -\sin(x + \frac{\delta x}{2}) \frac{\sin(\delta x/2)}{\delta x/2}$$

$= -\sin(x + 0) \cdot 1$

$= -\sin x$

$$\lim_{\delta x - 0} \frac{\delta y}{\delta x} = \frac{dy}{dx} = -\sin x$$

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

Solution

$\frac{dx}{dt} = -2t \quad \frac{dy}{dt} = 6t$

$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} \quad dy/dt \; / \; dx/dt$

$= \frac{6t}{-2t}$

$= -3t$ //

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

Using the Product rule

$\frac{dy}{dx} = V\frac{du}{dx} + U\frac{dv}{dx}$

let $u = x^2$ and $V = \cos 2xe^{4x}$

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

$V = \cos(2xe^{4x})$

Using the Chain rule

$U = 2xe^{4y}$ and $y = \cos u$

$\frac{du}{dx} = 2 \times 4xe^{4x}$ and $y = -\sin u$

$= 8e^{4x}$ and $y = -\sin u$

$\frac{dy}{dx} = 8e^{4x} x - \sin(2xe^{4x})$

$= -8e^{4x} \sin(2e^{4x})$

$\frac{dy}{dx} = \cos(2xe^{4x}) x 2x + x^2 x - 8e^{4x} \sin (2xe^{4})$

$= 2x\cos(2xe^{4x}) + -8x^2e^{4y}\sin(2xe^{4x})$

NAME - OLABODE CLINTON Oluwanifemi
Course - Maths 104
Department - Medical laboratory science
Matric no - 19/MHS06/024
Date - 6/07/2020

Maths 104 Assignment

1) function $y = 1/x - 2$

Solution

The function is defined for all numbers except $x=2$
Domain = Real numbers except $x=2$
Co-Domain = Real numbers except $y=0$

2) If $k = \ln v$, differentiate k

$$\frac{d}{dk}(\ln v) = \frac{1}{v}$$

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

$$2x - 2 = 3y$$

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

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

$$x^2 - 4 = y^2$$

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

4) If $P = \sin^{-4}$ find the derivative of P.

$$P = \frac{t}{\sin}$$

$$t = \sin P \text{ ---- (1)}$$

Recall that; $\sin^2 p + \cos^2 y = 1$ ---(2)

$$\frac{dt}{dP} \text{ of (1)} = \cos P$$

from (2) $\sin^2 P + \cos^2 P = 1$

$$\cos^2 P = 1 - \sin^2 P$$

$$\cos P = \sqrt{1 - \sin P}$$

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

$$\frac{dt}{dP} = \cos P = \sqrt{1 - t^2}$$

$$\therefore \frac{dP}{dt} = \frac{1}{\sqrt{1 - t^2}}$$

5a) $(f \circ g)x = f(g(x))$

$f(x) = 2x^2 - 5$

$g(x) = 4x - 2$

$$f(g(x)) = f(4x-2)$$
$$= 2(4x-2)^2 - 5$$
$$= (8x-4)^2 - 5$$
$$= 64x^2 - 32x - 32x + 16 - 5$$
$$= 64x^2 - 64 + 11$$

b) $(g \circ f)x$

$$g[f(x)] = g(2x^2 - 5)$$
$$= 4x - 2[2x^2 - 5]$$
$$= 4(2x^2 - 5) - 2$$
$$= (8x^2 - 20) - 2$$
$$= 8x^2 - 20 - 2$$
$$= 8x^2 - 22$$