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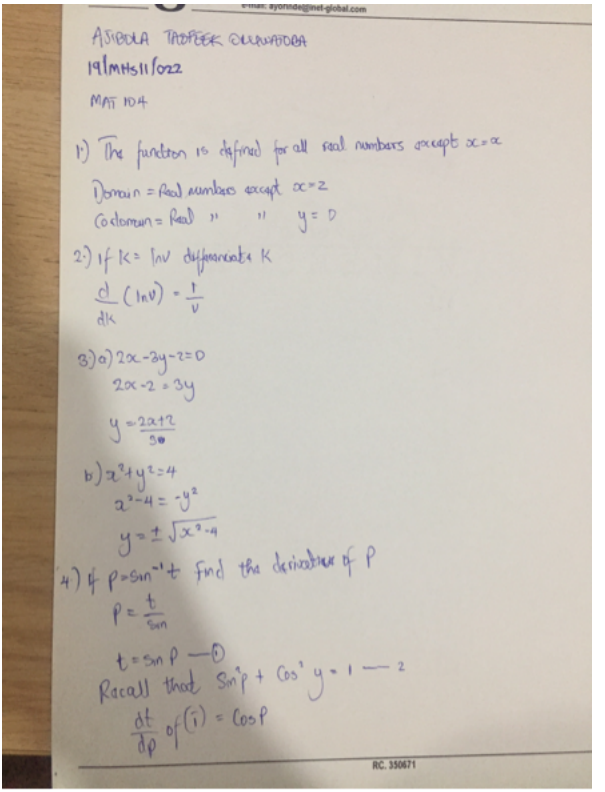

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19/MHS11/022

MAT 104

1) The function is defined for all real numbers except $x = \alpha$

Domain = Real numbers except $x = 2$

Codomain = Real " " $y = 0$

2) If $K = \ln v$ differentiate K

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

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

$2x - 2 = 3y$

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

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

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

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

4) If $P = \sin^{-1} t$ find the derivative of P

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

$t = \sin P$ — (1)

Recall that $\sin^2 P + \cos^2 y = 1$ — 2

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

RC. 350671

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

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

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

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

$\frac{dt}{dp} = \cos p = \sqrt{(1+t^2)^2}$

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

e) $F(x) = 2x^2 - 5 \quad g(x) = 4x - 2$

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

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

$= 2(16x^2 + 8x - 8x - 4) = 5$

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

$= 32x^2 - 2 - 5$

$= 32x^2 - 13$

b) $gOF(x) = g(2x^2 - 5) = 4(2x^2 - 5) - 2$

$= 8x^2 - 20 - 2$

$= 8x^2 - 22$

b) $F(x) = F_e(x) + F_o(x)$

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

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

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

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

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

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

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

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

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

$= 3x^3 + 1$

$\rightarrow F_o(x) = \frac{F(x) - F(-x)}{2}$

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

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

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

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

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

Recall: $F(x) = F_1(x) + F_2(x)$

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

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

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

7.) i) Differentiate $y = \cos x$

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

$\delta y = \cos(x + \delta x) - \cos x$ (5)

Recall

$\cos(A+B) - \cos(A-B) = -2\sin A \sin B$ (3)

Compare (1) & (2)

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

$A - B = x$ (4)

Add (3) & (4) & subtract (3) & (4)

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

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

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

Compare (6) & (2)

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

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

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 $\delta x \to 0$

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

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

$\delta x \to 0$

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

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

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

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

$\frac{dy}{dt} = 6t$; $\frac{dx}{dt} = \frac{-1}{t^2}$

$\frac{dy}{dx} = 6t \div \frac{-1}{t^2}$

$= 6t \times \frac{-1}{t^2} = \frac{-6 \times 2}{t^2} = \frac{12}{t^2}$

9) $y = x^2 \cos 2x + 4^x$

Sum

Take log of both sides

$\ln y = \ln x^2 + \ln \cos 2x + \ln 4^x$

Differentiating both with x

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

$+4$

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

Multiply both sides by y

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

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

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

Let $u = 3x^3 + 5$

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

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

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

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

$= 9x^2 \cos u$

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