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DEPARTMENT: PHARMACY　　MATRIC NO: 19/MHB11/149

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 co-domain is a set of al real numbers except $y=0$.

2. $k = \ln v$

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

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

$-3y = -2 + 2x$

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

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

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

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

$y^2 = 4 - x^2$

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

4) $p = \sin^{-}t$

$p = \sin^{-1}t \Rightarrow p = \frac{t}{\sin}$

$t = \sin p$

$$\frac{dt}{dp} = \cos p$$

$$dp/dt = \frac{1}{\cos p}$$

Recall

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

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

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

but $\sin p = t$

$\sin^2 p = t^2$

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

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

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

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

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

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

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

$fog(x) = 32x^2 - 32x + 8 - 5$

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

ii) $gof = g(2x^2 - 5)$

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

$gof(x) = 8x^2 - 20 - 2$

$gof(x) = 8x^2 - 22$

6) $fx = 3x^2 - 2x + 1 = 0$

$fe(x) + fo(x) = f(x)$

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

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

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

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

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

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

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

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

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

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

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

$fo(x) = \frac{-\cancel{4}^{2}x}{\cancel{2}}$

$fo(x) = -2x$

$f(x) = fe(x) + fo(x)$

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

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

$\therefore f(x)$ is truly $fe(x) + fo(x)$.

(7) $y = \cos x$ first principle

$y = \cos x$

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

subtract $y$ from both side

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

but $y = \cos x$

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

from trig identities

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

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

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

Compare eqn * & 2*

$A + B = x + \delta x$

$A - B = x$

$2A = 2x + \delta x$

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

$\left.\begin{aligned} A &= x + \frac{\delta x}{2} \\ B &= \frac{\delta x}{2} \end{aligned}\right\}$ eqn 3*

Compare eqn * & 2*

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

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

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

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

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

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

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

$\lim_{\delta x \to 0} \frac{\delta y}{\delta x} = -\sin(x + 0) \cdot 1$

$\lim_{\delta x \to 0} \frac{\delta y}{\delta x} = \frac{dy}{dx} = -\sin x \times 1$

$\frac{dy}{dx} = -\sin x$

8. $\frac{dy}{dx}$ if $y = 3t^2$ & $x = \frac{1}{t^2}$

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

if $y = 3t^2$ $dy/dt = 6t$

$x = 1/t^2$ $dx/dt = -2t^{-3}$

$\frac{dy}{dx} = 6t \div \frac{1}{-2t^{-3}}$

$\frac{dy}{dx} = 6t \times \frac{-2t^{-3}}{1}$

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

9. Find $dy/dx$ if $y = x^2 \cos 2x \, e^{4x}$

Find $\log_e$ of both side.

$\ln y = \ln(x^2 \cos 2x \; e^{4x})$

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

differentiate both sid.

$\frac{d}{dx}(\ln y) = \frac{d}{dx}(\ln x^2) + \frac{d}{dx}(\cos 2x) + \frac{d}{dx}(\ln e^{4x})$

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

$+ \frac{1}{e^{4x}}(4e^{4x})$

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

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

multiply both side by y

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

$\frac{dy}{dx} = x^2 \cos 2x \, e^{4x}\left(\frac{2}{x} - 2\tan 2x + 4\right)$

10. $y = \sin(3x^3 + 5)$ find the derivative of y $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

Using chain rule

let $u = 3x^3 + 5$ $\frac{dy}{dx} = 9x^2$

let $y = \sin u$ $\frac{dy}{du} = \cos u$

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

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

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

but $u = 3x^2 + 5$

$\frac{dy}{dx} = 9x^2 \cos(3x^2 + 5)$