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

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

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

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

$\frac{dt}{dp}$ of $(T) = \cos p$

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

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

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

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

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

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

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

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

using the product rule

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

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

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

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

using chain rule $dy/dx - du/dx \times dy/dx$

$u = 2xe$ and $y = \cos u$

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

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

$du/dx = 8e^{4x} \times -\sin(2xe^{4x})$

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

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

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

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

$$\frac{\delta y}{\delta x} = \lim -\sin\left[x + \frac{\delta x}{2}\right] \frac{\sin\left[\frac{\delta x}{2}\right]}{\frac{\delta x}{2}}$$

$$= -\sin[x + 0] - 1$$

$$= -\sin x$$

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

$\to 0$

$y = 3t^{0}$ $x = 1/t^{2}$

solution

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

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

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

$$= -3t$$

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

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

$u = 3x^3 + 5$ $y = \sin u$

$= 9x$ $y = \cos y$

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

$$= 9x \cos u$$

since $u = 3x^3 + y$

$dy/dx = 9x \cos(3x + 5)$

2. If $K = \ln Y$, differentiate K

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

7. $y = \cos x$ from 1st principle

$y = \cos x$

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

subtract y from both sides

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

but $y = \cos x$

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

considering trigonometry

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

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

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

compare (1) and (2)

Let $A + B = x + \delta x$ —— (i)

$A - B = x$ —— (ii)

adding (i) and (ii)

$2A = 2x + \delta x$

$A = \frac{2x + \delta x}{2} \Rightarrow A = x + \frac{\delta x}{2}$ —— (iii)

supstitute equation (iii) in (ii)

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

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

compare (1) and (2)

Compare $[x + \delta x] - \cos x = -2\sin[x + \delta x/2]\sin[\delta x/2]$

$\therefore \delta y = -2\sin[x + \delta x/2]\sin[\delta x/2]$

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

$\frac{\delta y}{\delta x} = \frac{-\sin[x + \delta x/2]\sin[\delta x/2]}{\delta x/2}$

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

A standard limit

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

) $(g \circ f)x$

$g[f(x)] = g(2x^2-5)$

$= 4x - 2(2x^2-5]$

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

$= [8x^2-20]-2$

$= 8x^2-20-2$

$= 8x^2-22$

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

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

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

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

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

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

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

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

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

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

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

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

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

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① Function $y = 1/x-2$

Solution

The function is defined for all real numbers except $x = 2$

Domain = Real numbers except $x = 2$

co domain = Real numbers except $y = 0$

② Express ~~as~~ y as an explicit function of $x = 4$

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. Function~~

5.) $f(x) = 2x^2 - 5$, $y(x) = 4x - 2$ find $fog(x)$ and $gof(x)$

Solution

a.) $(fog)x = f(g(x)]$

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

$g(x) = 4x - 2$

$F(g(x)] = F(4x - 2)$

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

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

$= 64x^2 - 32x - 32x + 16 - 5$

$= 64x^2 - 6\cancel{4} + 11$