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19/MAR 11/144
MAT 104

PHARMACY

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

Domain = Real numbers except $x=2$

Codomain = 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 $P = \sin^{-1} t$ find the derivative of P

$$P = t$$

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

Recall that $\sin^2 P + \cos^2 P = 1$ --- (2)

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

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

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

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

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

$$dt = \cos P / \sqrt{(1+t)^2}$$

\overline{dp}

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

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

$$\begin{aligned} a) f \circ g(x) &= f(4x - 2) = 2(4x - 2)^2 - 5 \\ &= 2(4x - 2)(4x + 2) - 5 \\ &= 2(16x^2 + 2x - 3x - 4) - 5 \\ &= 2(16x^2 - 4) - 5 \\ &= 32x^2 - 2 - 5 \\ &= 32x^2 - 13 // \end{aligned}$$

$$\begin{aligned} b) g \circ f(x) &= g(2x^2 - 5) = 4(2x^2 - 5) - 2 \\ &= 8x^2 - 20 - 2 \\ &= 8x^2 - 22 \\ &\quad \text{or} \\ &= 2(4x^2 - 11) \end{aligned}$$

$$6) f(x) = f_e(x) + f_o(x)$$

$$\text{If } f(x) = 3x^2 - 2x + 1$$

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

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

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

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

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

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

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

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

$$= 3x^2 + 1$$

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

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

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

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

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

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

Recall : $f(x) = f_e(x) + f_o(x)$

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

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

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

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

let $(3x^3 + 5)$ be u

$$y = \sin u$$

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

$$u = 3x^3 + 5$$

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

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

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

$$\text{recall } u = 3x^3 + 5$$

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

$$1) y = \cos x$$

$$y + fy = \cos(x + fx)$$

$$fy = \cos(x + fx) - y$$

$$fy = \cos(x + fx) - \cos x$$

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

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

$$(\cos A + B) - (\cos A - B) = 0 - 2 \sin A \sin B$$

$$A + B = x + fx$$

$$A - B = x$$

$$2A = 2x + fx$$

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

$$A - B = x$$

$$B = A - x = \frac{2x + fx}{2} - x$$

$$B = \frac{fx}{2}$$

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

Continuation

$$7) Fy = -2 \sin(x + \frac{fx}{2}) \sin(\frac{fx}{2})$$

$$\frac{Fy}{x} = \frac{-\sin(x + \frac{fx}{2}) \sin(\frac{fx}{2})}{\frac{fx}{2}}$$

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

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

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

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

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

$$\frac{dy}{dx} = \frac{6t}{\frac{-2}{t^3}} = \frac{6t \times t^3}{-2} = \frac{6t^4}{-2} = -3t^4$$

$$= \frac{6t^4}{-2} = -3t^4$$

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

9) Taking loge of both sides

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

~~Differentiate~~ Differentiating both wrt x

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

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

multiplying both sides by 'y'

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

$$x^2 \cos 2x e^{4x} \times \left(\frac{2}{x} - \frac{2 \sin 2x}{\cos 2x} + 4 \right)$$