

Question # 1

Part a) Differentiate $\frac{3x^3 - 5x^2 + 5}{x^2 + 1}$ w.r.t "x"

Let

$$P = \frac{3x^3 - 5x^2 + 5}{x^2 + 1}$$

By APPLYING Quotient rule

$$\frac{dP}{dx} = \frac{(x^2 + 1) \frac{d}{dx} (3x^3 - 5x^2 + 5) - (3x^3 - 5x^2 + 5) \frac{d}{dx} (x^2 + 1)}{(x^2 + 1)^2}$$

$$\frac{dP}{dx} = \frac{(x^2 + 1) \left(3 \frac{d}{dx} x^3 - 5 \frac{d}{dx} x^2 + \frac{d}{dx} 5 \right) - (3x^3 - 5x^2 + 5) \left(\frac{d}{dx} x^2 + \frac{d}{dx} 1 \right)}{(x^2 + 1)^2}$$

$$\frac{dP}{dx} = \frac{(x^2 + 1)(9x^2 - 10x + 0) - (3x^3 - 5x^2 + 5)(2x + 0)}{(x^2 + 1)^2}$$

$$\frac{dP}{dx} = \frac{(x^2 + 1)(9x^2 - 10x) - (3x^3 - 5x^2 + 5)(2x)}{x^4 + 2x + 1}$$

$$\frac{dP}{dx} = \frac{(9x^4 + 9x^2 - 10x^3 - 10x) - (6x^4 - 10x^3 + 10x)}{x^4 + 2x + 1}$$

$$\frac{dP}{dx} = \frac{9x^4 + 9x^2 - 10x^3 - 10x - 6x^4 + 10x^3 - 10x}{x^4 + 2x + 1}$$

$$\frac{dP}{dx} = \frac{9x^4 - 6x^4 - 10x^3 + 10x^3 + 9x^2 - 10x - 10x}{x^4 + 2x + 1}$$

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$$\frac{dP}{dn} = \frac{9x^4 - 6x^4 - 10x^3 + 10x^3 + 9x^2 - 10x - 10x}{x^2 + 2x + 1}$$

$$\frac{dP}{dn} = \frac{3x^4 + 0x^3 + 9x^2 - 20x}{x^2 + 2x + 1}$$

$$\frac{dP}{dn} = \frac{3x^4 + 9x^2 - 20x}{x^2 + 2x + 1}$$

$$\frac{dP}{dn} = \frac{3x^2(x^2 + 3) - 20x}{(x^2 + 1)^2}$$

$$P' = \frac{3x^4 + 9x^2 - 20x}{x^2 + 2x + 1} \Rightarrow \frac{3x^4 + 9x^2 - 20x}{x^2 + 1)^2}$$

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QUESTION 1
PART (b)

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

Let

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

By Applying Quotient Rule

$$\frac{d}{dx} Q = \frac{(x^2-1) \frac{d}{dx} (x^2+1)^2 - (x^2+1)^2 \frac{d}{dx} (x^2-1)}{(x^2-1)^2}$$

~~$$\frac{d}{dx} Q = \frac{(x^2-1) 2(x^2+1) \frac{d}{dx} (x^2+1) - (x^2+1)^2 \left(\frac{d}{dx} x^2 - \frac{d}{dx} 1 \right)}{(x^2-1)^2}$$~~

$$\frac{d}{dx} Q = \frac{(x^2-1) 2(x^2+1) \left(\frac{d}{dx} x^2 + \frac{d}{dx} 1 \right) - (x^2+1)^2 (2x-0)}{(x^2-1)^2}$$

$$\frac{d}{dx} Q = \frac{(x^2-1) 2(x^2+1) (2x+0) - (x^2+1)^2 (2x)}{(x^2-1)^2}$$

$$\frac{d}{dx} Q = \frac{(x^2-1) 2(x^2+1) (2x) - (2x)(x^2+1)^2}{(x^2-1)^2}$$

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$$\frac{dQ}{dx} = \frac{(x^2-1)(x^2+1) \cdot 2(4x) - (2x)(x^2+1)^2}{(x^2-1)^2}$$

$$\frac{dQ}{dx} = \frac{(x^4+x^2-x^2-1)(4x) - (2x)(x^4+2x^2+1)}{(x^2-1)^2}$$

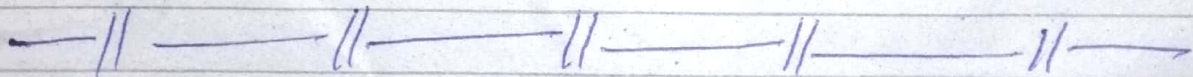
$$\frac{dQ}{dx} = \frac{4x^5 + 4x^3 - 4x^3 - 4x - 2x^5 - 4x^3 - 2x}{(x^2-1)^2}$$

$$\frac{dQ}{dx} = \frac{4x^5 - 2x^5 - 4x^3 - 4x^3 + 4x^3 - 4x - 2x}{(x^2-1)^2}$$

$$\frac{dQ}{dx} = \frac{2x^5 - 8x^3 + 4x^3 - 6x}{(x^2-1)^2}$$

$$\frac{dQ}{dx} = \frac{2x^5 - 4x^3 - 6x}{(x^2-1)^2}$$

ANSWER



QUESTION # 3

Part # 1

$$= \int \frac{1}{\sqrt{x^2}} dx$$

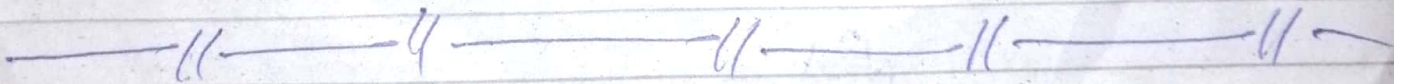
Let

$$A = \int \frac{1}{\sqrt{x^2}} dx$$

$$A = \int \frac{1}{(x^2)^{\frac{1}{2}}} dx$$

$$A = \int \frac{1}{x} dx$$

$$A = \ln |x| + C$$



QUESTION # 3

PART # b

$$= \int \frac{1}{(6x+7)^6} dx$$

Let

$$L = \int \frac{1}{(6x+7)^6} dx$$

~~Using the substitution~~

$$\text{let } t = 6x+7$$

$$L = \int \frac{1}{t^6} dx$$

$$L = \int \frac{1}{6} \frac{1}{t^6} dt$$

$$L = \frac{1}{6} \int \frac{1}{t^6} dt$$

$$L = \frac{1}{6} \times \left(-\frac{1}{5t^5} \right)$$

Putting values of t

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$$L = \frac{1}{6} \times \left(-\frac{1}{5(6x+7)^5} \right)$$

$$L = \frac{1}{6} \times \left(-\frac{1}{5(6x+7)^5} \right)$$

$$L = \frac{1}{6} \times \left(-\frac{1}{5(6x+7)^5} \right) + C$$

where $C \in \mathbb{R}$.

ANSWER

