Question # 1

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

Let

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

BY APPLYING Quotient rule

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

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

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

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

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

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

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

Page # 2

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

$$\frac{dP}{dx} = \frac{3x^4 + 0x^3 + 9x^2 \cancel{-10x} - 20x}{x^4 + 2x + 1}$$

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

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

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

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

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

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

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

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

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

Page # 4

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

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

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

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

$$\frac{d}{dx}Q = \frac{2x^5\cancel{-8x^3}-4x^3-6x}{(x^2-1)^2}$$

$$\frac{d}{dx}Q = \frac{2x^5-4x^3-6x}{(x^2-1)^2}$$ $\boxed{\text{ANSWER}}$

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 subs~~

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

Page #7

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

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

$$L = \cancel{\frac{1}{6}} \cancel{\times} - \frac{1}{30(6x+7)^5} + C$$

where $C \in R$.

ANSWER