

14582 ① Mujahid Iqbal

Mujahid Iqbal

10 - 14582 BS (SE) (A)

Calculus and Analytical Geometry

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Mid Term Paper

10-14582 (2) Mujahid Khan

Q No 1: (a)

Differentiate $\frac{3x^3 - 5x^2 + 5}{x^2 + 1}$ with

respect to x ?

Sol. (a)

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

W. r. t. x

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

Use Quotient rule

$$\Rightarrow \frac{(9x^2 - 10x)(x^2 + 1) - (3x^3 - 5x^2 + 5)(2x)}{(x^2 + 1)^2}$$

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

$$\Rightarrow \left(\frac{3x^4 + 9x^2 - 20x}{(x^2 + 1)^2} \right) \text{ Ans}$$

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(b) Differentiate $\frac{(x^2+1)^2}{x^2-1}$ with respect to x .

Sol

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

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

Now we use Quotient rule

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

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

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

$$\left(\frac{x^2 - 2x - 1}{(x-1)^2} \right) \text{ Ans}$$

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Q(3) = (a)

Find the integration of $\int \frac{1}{\sqrt{x^3}} dx$ -

$$\int \frac{1}{\sqrt{x^3}} dx$$

Sol

$$\Rightarrow \int (x^3)^{-\frac{1}{2}} dx$$

$$\Rightarrow \int x^{-\frac{3}{2}} dx$$

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

$$\Rightarrow \frac{x^{-\frac{1}{2}}}{-\frac{1}{2}}$$

$$\Rightarrow \left(\frac{-2}{\sqrt{x}} + C \right)$$

Ans

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Q3 = (b)

Find the integration of $\int \frac{1}{(6x+7)^6} dx$?

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

Sol: $\int (6x+7)^{-6} dx$
 \div both side by 6

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

$$\Rightarrow \frac{1}{6} \int \frac{(6x+7)^{-6+1}}{-6+1} + C$$

$$\Rightarrow \frac{1}{6} \frac{(6x+7)^{-5}}{-5} + C$$

$$\Rightarrow - \frac{(6x+7)^{-5}}{30} + C$$

$$\Rightarrow \left(- \frac{1}{30(6x+7)^5} + C \right) \text{ Ans}$$

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Ques: (a) Find $\frac{dy}{dx}$ if $y = (1+2\sqrt{x})^3 \cdot x^{\frac{2}{3}}$

using chain rule?

Sol: $y = (1+2\sqrt{x})^3 \cdot x^{\frac{2}{3}}$

$$\frac{dy}{dx} = (1+2\sqrt{x})^3 \cdot x^{\frac{2}{3}}$$

using by chain rule

$$\Rightarrow (1+2\sqrt{x})^3 \frac{d}{dx} x^{\frac{2}{3}} + x^{\frac{2}{3}} \frac{d}{dx} (1+2\sqrt{x})^3$$

$$\Rightarrow (1+2\sqrt{x})^3 \left[\frac{2}{3} \frac{d}{dx} (x) + x^{\frac{2}{3}} \right] \cdot 3 \left[\frac{d}{dx} (1+2\sqrt{x}) \right]$$

$$(1+2\sqrt{x})^3 \left[\frac{2}{3} (1) + x^{\frac{2}{3}} \cdot 3 (0+2\sqrt{x}) \right]$$

$$(1+2\sqrt{x})^3 \cdot \frac{2}{3} + x^{\frac{2}{3}} + 6\sqrt{x}$$

Ans

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(7)

subjected when

Q2: (b) find $\frac{dy}{dx}$ if $y = \sqrt{\frac{1-x}{1+x}}$ using chain rule?

$$y = \sqrt{\frac{1-x}{1+x}}$$

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

using chain rule.

$$\Rightarrow \frac{(1+x)^{1/2} \frac{d}{dx} (1-x)^{1/2} - (1-x)^{1/2} \frac{d}{dx} (1+x)^{1/2}}{(\sqrt{1+x})^2}$$

$$\Rightarrow \frac{(1+x)^{1/2} \left(\frac{1}{2} \frac{d}{dx} (1-x) \right) - (1-x)^{1/2} \left(\frac{1}{2} \frac{d}{dx} (1+x) \right)}{(\sqrt{1+x})^2}$$

$$\frac{(1+x)^{1/2} \left(\frac{1}{2} (-1) \right) - (1-x)^{1/2} \left(\frac{1}{2} (1) \right)}{(\sqrt{1+x})^2}$$

$$\frac{(1+x)^{1/2} \left[-\frac{1}{2} - (1-x)^{1/2} \left(\frac{1}{2} \right) \right]}{(\sqrt{1+x})^2}$$

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

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$$\Rightarrow \frac{-\frac{1}{2} + \frac{3}{2} - (1-x)\frac{1}{2}}{\sqrt{1+x}}$$

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

$$\left(\frac{2 - \sqrt{1-x}}{\sqrt{1+x}} \right)$$

Ans