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QUESTION 1

$$\int \frac{2x}{\sqrt{4x^2-1}}\,dx$$

SOLUTION

Let $u = (4x^2-1)^{1/2}$

$$\frac{du}{dx} = \frac{(4x^2-1)^{-1/2}}{2} \times 8x$$

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

$$\frac{du}{dx} = \frac{4x}{(4x^2-1)^{1/2}}$$

$$dx = \frac{(4x^2-1)^{1/2}}{4x}\,du$$

$$= 2\int \frac{x}{u} \cdot \frac{(4x^2-1)^{1/2}}{4x}\,du$$

$$= 2\int \frac{x}{(4x^2-1)^{1/2}} \cdot \frac{(4x^2-1)^{1/2}}{4x}\,du$$

$$= \frac{2}{4}\int du$$

$$= \frac{1}{2}u + c$$

$$= \frac{\sqrt{4x^2-1}}{2} + C$$

$$\therefore \int \frac{2x}{(4x^2-1)^{1/2}}\,dx = \frac{\sqrt{4x^2-1}}{2} + C$$

QUESTION 2

$$\int \frac{\sin^{-1}x}{\sqrt{1-x^2}}\,dx$$

SOLUTION

Let $u = \sin^{-1}x$

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

$$dx = \sqrt{1-x^2}\cdot du$$

$$dx = \frac{du}{(1-x^2)^{-1/2}}$$

$$\int \frac{u}{(1-x^2)^{-1/2}} \cdot du\,(1-x^2)^{1/2}$$

$$\int u\cdot du$$

$$= \frac{u^2}{2} + c$$

$$\therefore \int \frac{\sin^{-1}x}{(1-x^2)^{1/2}}\,dx = \frac{(\sin^{-1}x)^2}{2} + c$$

3 $\int (\tan x)^6 \sec^2 x\,dx$

SOLUTION

Let $u = \tan x$

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

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

$$\int u^6 \cdot \sec^2 x \cdot \frac{du}{\sec^2 x}$$

$$\int u^6\cdot du = \frac{u^7}{7} + c$$

$$\therefore \int (\tan x)^6 \sec^2 x\,dx = \frac{(\tan x)^7}{7} + c$$