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191MHS01I003

MBBS

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

Soln

let $u = 4x^2 - 1$

$$\left(\frac{u-1}{4}\right)^{1/2} = x$$

$$x = \left(\frac{u-1}{4}\right)^{1/2} \Rightarrow \frac{(u-1)^{1/2}}{2}$$

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

$$dx = du \Big/ 4(u-1)^{1/2}$$

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

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

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

$$= \frac{1}{4}\left\{\frac{u^{1/2}}{1/2}\right\} + c$$

$$= \frac{2}{4}\left\{(4x^2-1)^{1/2}\right\} + c$$

$$\int \frac{2x}{\sqrt{4x^2-1}}\,dx = \frac{1}{2}\left\{\sqrt{4x^2-1}\right\} + c$$ //

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

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

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

$dx = (\sqrt{1-x^2})\,du$

$$\int \frac{\sin^{-1}x}{\sqrt{1-x^2}}\,dx = \int \frac{u}{\sqrt{1-x^2}} \cdot \sqrt{1-x^2}\,du$$

$$= \int u\,du$$

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

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

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

Soln

$u = \tan x, \quad \frac{du}{dx} = \sec^2 x$

$$dx = du / \sec^2 x$$

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

$$= \frac{u^7}{7} + C$$

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