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MBBS MAT 104

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

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

$u^2 = 4x^2-1$

$u^2+1 = 4x^2$

$x = \sqrt{\frac{u^2+1}{4}} \quad \therefore x = \left(\frac{u^2+1}{4}\right)^{1/2}$

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

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

$2\int \left(\frac{u^2+1}{4}\right)^{1/2} \cdot \frac{1}{u} \cdot \frac{u\,du}{4}\left(\frac{u^2+1}{4}\right)^{-1/2}$

$\frac{2}{4}\int \frac{u}{u}\,du$

$$\frac{2}{4}\int du = \frac{1}{2}[u] + c$$

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

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

$\int \sin^{-1}x \cdot \left(\sqrt{1-x^2}\right)^{-1} dx$

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

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

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

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

$\int u\,du$

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

$= \frac{(\sin^{-1}x)^2}{2}\,du$

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

Solution

$u = \tan x$

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

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

$\int u^6 \, du$

$\left[\frac{u^7}{7}\right] + c$

$\frac{(\tan x)^7}{7} + c$