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MBBS
Mat 104

Assignment.

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

soln

let $u = 4x^2 - 1$

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

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

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

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

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

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

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

$= \frac{1\cancel{2}}{\cancel{4}_2}\left[(4x^2-1)^{1/2}\right] + c$

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

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

Soln

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

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

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

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

$= \int u\, du$

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

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

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

Soln

let $u = \tan x$; $\frac{du}{dx} = \sec^2 x$

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

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

$= \int u^6\, du$

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

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