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Matric No: 19/MHS01/013
Course: MAT1104 Assignment.

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

Solution

let $u = 4x^2 - 1$

Make x subject of the formular

$\frac{u+1}{4} = \frac{4x^2}{4}$

$x = \sqrt{\frac{u+1}{4}}$

$x = \frac{\sqrt{u+1}}{2}$

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

$dx = du / 4(u+1)^{1/2}$

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

$= \int \frac{1}{\sqrt{u}} \cdot \frac{du}{4}$

$= 1/4 \int \frac{1}{\sqrt{u}}\,du$

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

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

$\frac{1}{4} \times 2\,[u^{1/2}] + C$

$\frac{2}{4}$

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

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

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

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

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

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

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

$$\int u\,du = \frac{u^{1+1}}{2}\,du$$

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

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

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

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

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

$$\int u^6 \cdot \sec^2 x \cdot \frac{du}{\sec^2 x} = \frac{u^7}{7} + c$$

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