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COURSE: MAT 104.
MATRIC NO: 19/MHS01/416.
S/N: 147.

Assignment:

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

Solution:

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

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

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

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

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

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

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

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

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

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

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

Solution.

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

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

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

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

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

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

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

$$\int u\,du$$

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

$$\Rightarrow \frac{(\sin^{-1} x)^2}{2} dx$$

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

Solution.

$$u = \tan x$$

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

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

$$\int u^6\,du$$

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

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