PAL pensions

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ASSIGNMENT ON INTEGRATION.

1. $\int \frac{2x}{\sqrt{4x^2-1}}\,dx$ 2. $\int \frac{\sin^{-1}x}{\sqrt{1-x^2}}\,dx$ 3. $\int (\tan x)^6 \sec^2 x\,dx$

ANSWER

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$= \int u\,du$

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

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

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

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

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

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

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