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MATRIC NO: 19/mhs01/076

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

Sol

Let $u = 4x^2 - 1$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Sol

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

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

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

$= \int u^6\,du$

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

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