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Course: Math 104

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

Let $u = 4x^2 - 1$

$\frac{du}{dx} = 8x \Rightarrow \frac{dx}{du} = \frac{1}{8x}$

$dx = \frac{du}{8x}$

$\Rightarrow \int \frac{2x}{u^{1/2}}\,dx = \int 2x \cdot \frac{du}{8x} \cdot u^{-1/2}$

$\Rightarrow \int \frac{2x}{8x} \cdot du \cdot u^{-1/2}$

$\frac{1}{4}\int du \cdot u^{-1/2} = \frac{1}{4} \times \frac{u^{-1/2+1}}{-1/2+1} + C$

$\int \frac{2x}{\sqrt{4x^2-1}}\,dx = \frac{1}{4} \times \frac{u^{1/2}}{1/2} + C = \frac{1}{2}u^{1/2} + C$

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

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

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

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

$\int u\,du = \frac{u^2}{2} + C = \frac{(\sin^{-1}x)^2}{2} + C$

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

Let $u = \tan x$

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

$\therefore \int (\tan x)^6 \sec^2 x \, dx = \int u^6 \, du$

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

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