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① $\int \frac{2x}{\sqrt{4x^2-1}}\,dx$

let $u = \sqrt{4x^2-1}$

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

make x the subject of the formula

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

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

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

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

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

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

make dx the subject of the formula

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

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

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

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

$= \int \frac{du}{2}$

$$\frac{1}{2}\int du$$

$$\frac{1}{2}\cdot u + C$$

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

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

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

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

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

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

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

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

③ $$\int(\tan x)^6\sec^2x\,dx$$

Let $u = \tan x$.

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

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

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

$$\cancel{dx = \frac{du}{\sec^2 u}}$$

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

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

$$\frac{u^{6+1}}{6+1} + C$$

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

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