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

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

$\frac{du}{dx} = \frac{1}{2}(4x^2-1)^{-1/2} \times 8x$

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

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

=> we have

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

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

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

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

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

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

$= \frac{(\sin^{-1}x)^2}{2} + c$

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

let $u = \tan x$

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

$\therefore \int u^6 \, du = \frac{u^7}{7} + c$

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