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

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

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

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

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

We have

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

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

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

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

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

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

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

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

$$= \frac{(\sin^{-1} a)^2}{2} + C$$

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

$$\text{let } u = \tan x$$

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

we have

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

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