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Medicine and Surgery

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MAT 104

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

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

$$du = 8x \cdot dx$$

$$\frac{du}{4} = 2x dx$$

$$\int \frac{\frac{du}{4}}{\sqrt{u}} = \int \frac{1/4}{\sqrt{u}} \cdot du$$

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

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

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

$$= \frac{1}{2} u^{1/2} + C$$

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

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

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

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

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

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

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

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

$$= \int u \, du$$

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

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

$$u = \tan x$$

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

$$dx$$

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

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

$$\left[\frac{u^7}{7} \right] + c$$

$$\frac{(\tan x)^7}{7} + c$$
$$\underline{\quad}$$