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MATH 104 ASSIGNMENT

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

Solution

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

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

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

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

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

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

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

$$= \frac{1}{4} \left\{ \frac{u^{1/2}}{1/2} \right\} + C$$

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

$$\therefore \int \frac{2x}{\sqrt{4x^2-1}} dx = \frac{1}{2} \left\{ \sqrt{4x^2-1} \right\} + C_{11}$$

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

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

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

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

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

$$= \int u du$$

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

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

③  $\int (\tan x)^6 \sec x dx$

Solution

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

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

$$= \int u^6 \times \sec^2 x \times \frac{du}{\sec^2 x}$$

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

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