20/4/20 MAT 108 Assignment

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①

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

$\int \frac{2x}{\sqrt{4x^2-1}}\,dx$, let $u = 4x^2 - 1$

$$\frac{du}{dx} = 8x$$

$dx = \frac{du}{8x}$ sub these into the original equation

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

$$\int \frac{du}{4} \cdot u^{-1/2} = \frac{1}{4}\int u^{-1/2}\,du = \frac{1}{4}\left[\frac{2}{1}u^{1/2}\right]$$

$$\int \frac{2x}{\sqrt{4x^2-1}}\,dx = \frac{1}{2\cancel{4}} \times \cancel{2}\left[4x^2-1\right]^{1/2}$$

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

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③ $\int \frac{\sin^{-1} dx}{\sqrt{1-x^2}}$

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

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

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

Substituting into 6

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

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

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

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

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

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⑬ $\int (\tan x)^6 \sec^2 x \, dx$

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

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

Substituting into 6

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

$$\int (\tan x)^6 \sec^2 x \, dx = \int u^6 \cancel{\sec^2 x} \, \frac{du}{\cancel{\sec^2 x}}$$

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

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