

UKANWA NNERMA GEM

19/MAR/2015

MAT 104 ASSIGNMENT

$$D) \int \frac{2x}{\sqrt{4x^2-1}} dx = \frac{1}{2} \sqrt{4x^2-1} + C$$

Sol

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

$$\frac{du}{4} = \frac{4x^2}{4} \quad x = \sqrt{\frac{u+1}{4}}$$

$$x = \frac{\sqrt{u+1}}{2}$$

$$\frac{dx}{du} = \frac{1}{4(u+1)^{3/2}}$$

$$dx = \frac{du}{4(u+1)^{3/2}}$$

$$\int \frac{2x}{\sqrt{4x^2-1}} dx = \int \frac{2(u+1)^{3/2} \cdot \frac{1}{2} \cdot \frac{du}{4(u+1)^{3/2}}}{\sqrt{u}}$$

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

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

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

$$= \frac{2}{4} [u^{1/2}] + C$$

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

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

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

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

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

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

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

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

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

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

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

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

$$\int u^6 \cdot \sec^2 x \cdot \frac{du}{\sec^2 x} = \frac{u^7}{7} + C$$

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