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MATRIC NO: 19/MHS01/277

DEPARTMENT: M.B.B.S

COURSE: PHAT 104

Assignment

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

Solution

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

Let $p = 4x^2 - 1$

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

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

$\int \frac{2x}{\sqrt{4x^2-1}} dx = \int \frac{2x}{\sqrt{p}} \cdot \frac{dp}{8x}$

$\int \frac{2x}{\sqrt{4x^2-1}} dx = \frac{1}{4} \int \frac{dp}{\sqrt{p}}$

$\int \frac{2x}{\sqrt{4x^2-1}} dx = \frac{1}{4} \int \frac{1}{\sqrt{p}} dp$

$\int \frac{2x}{4x^2-1} dx = \frac{1}{4} \int \frac{1}{p^{1/2}} dp$

$$\int \frac{2x}{\sqrt{4x^2-1}}\,dx = \frac{1}{4}\int p^{-1/2}\,dp$$

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

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

$$\int \frac{2x}{\sqrt{4x^2-1}}\,dx = \frac{1}{4}\left[p^{1/2} \div \frac{1}{2}\right] + C$$

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

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

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

where C is the constant of the integration

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

Solution

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

Let $v = \sin^{-1}x$

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

$dx = \sqrt{1-x^2}\, dv$

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

$$\int \frac{\sin^{-1}x}{\sqrt{1-x^2}} = \int v\, dv$$

$$\int \frac{\sin^{-1}x}{\sqrt{1-x^2}} = \frac{v^{1+1}}{1+1} + c$$

$$\int \frac{\sin^{-1}x}{\sqrt{1-x^2}} = \frac{v^2}{2} + c$$

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

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

Solution

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

Let $u = \tan x$

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

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

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

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

$$\int (\tan x)^6 \sec^2 x \, dx = \frac{u^{6+1}}{6+1} + C$$

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

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