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Course: MAT 104

Assignment

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

Solution

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

Let $f = 4x^2-1$

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

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

$$\int \frac{2x}{\sqrt{4x^2-1}}\,dx = \int \frac{\cancel{2x}}{\sqrt{f}} \cdot \frac{df}{4\cancel{8x}}$$

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

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

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

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

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

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

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

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

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

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

Where C is the constant of integration

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

Solution

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

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

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

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

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

$\int \frac{\sin^{-1}x}{\sqrt{1-x^2}} = \int a\,da$

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

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

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

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

Solution

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

Let $v = \tan x$

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

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

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

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

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

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

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