ASSIGNMENT

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

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

3) $\int (\tan x)^n \sec^2 x\,dx \Rightarrow \begin{cases} u = \tan x \\ du = \sec^2 x\,dx \\ u^n\,du = u \end{cases}$

1) Soln

let $v = 4x^2-1$

$v+1 = 4x^2$

$\frac{v+1}{4} = x^2$

$x = \frac{1}{4(v+1)^{1/2}}$ (making x the subject)

$\frac{dx}{dv} = \frac{1}{4(v+1)^{1/2}}$

making dx the subject of the formula

$dx = \frac{dv}{4(v+1)^{1/2}}$

$\int \frac{2x}{\sqrt{4x^2-1}}\,dx = \int \frac{2(v+1)^{1/2}}{2} = \frac{1}{\sqrt{v}} \cdot \frac{dv}{4(v+1)^{1/2}}$

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

$\int \frac{2x}{\sqrt{4x-1}}\,dx = \frac{1}{4}\int \frac{1}{\sqrt{v}}\,dv$

② Ndubuisi Oziorna Laurel
19/MHS01/256

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

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

$$\int \frac{2x}{\sqrt{4x^2-1}}\,dx = \frac{1}{4}\left(2\sqrt{4}\right)+c$$

$$\int \frac{2x}{\sqrt{4x^2-1}}\,dx = \frac{1}{2}\times\sqrt{v}+c \quad (\text{recall } v = 4x^2-1)$$

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

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

Solution

let v be $\sin^{-1}x$

recall the differential of $\sin^{-1}x = \frac{1}{\sqrt{1-x^2}}$

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

$$dx = d\cdot\left(\sqrt{1-x^2}\right)dv$$

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

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

$$\int \frac{\sin^{-1}x}{\sqrt{1-x^2}} = \left[\frac{u^{1+1}}{2}\right]+c$$

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

Solution

let v be

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

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

$\int (\tan x)$

$\int (\tan x)$

$\int (\tan x)$

Recall

$\int (\tan x)$

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+1) + e

2) + e

) + e

+ e (recall $v = 4x^2 - 1$)

+ e

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

$1 - x^2\, dv$

Ndukwu Ozioma Laura
19/MHS01/256

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

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

5) Soln

let v be $\tan x$

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

$dx = \frac{dv}{\sec^2 x}$ (making dx the subject of the formula)

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

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

$\int (\tan x)^6 \sec^2 x\, dx = \left(\frac{u^{6+1}}{7}\right) + C$

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

Recall $u = \tan x$

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