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19/MHS01/009

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

Solution

let $u = \sqrt{4x^2-1} = (4x^2-1)^{1/2}$

$\frac{du}{dx} = \frac{1}{2}(4x^2-1)^{-1/2} \cdot 8x$

$du = 4x(4x^2-1)^{-1/2}dx$

$\frac{du}{dx} = 4x(4x^2-1)^{-1/2}$

$dx = \frac{du}{4x(4x^2-1)^{-1/2}} = \frac{\cancel{4x}(4x^2-1)^{-1/2}du}{4x\cancel{(4x^2-1)^{-1/2}}}$

we have

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

$= \frac{1}{2}\int du$

$= \frac{1}{2}u + c = \frac{1}{2}\sqrt{4x^2-1} + c$

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

Solution

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

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

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

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

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

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

Solution

let $u = \tan x$

$du = \sec^2 x \, dx$

we have

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