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19/mhs01/269
MB65

MAT 104 assignment

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

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

Let $u = 4x^2 - 1$

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

$8x\,dx = du \Rightarrow dx = du/8x$

$= \int 2x \cdot u^{-1/2} \cdot \frac{du}{8x}$

$= \frac{1}{4}\int u^{-1/2}\,du$

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

$= \frac{1}{4_2} \times 2u^{1/2} + C$

$= 1/2\,u^{1/2} + C$

$= 1/2\sqrt{4x^2-1} + C$

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

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

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

$x = \sin u$

$\frac{dx}{du} = \cos u$

Recall $\sin^2 u + \cos^2 u = 1$

$\cos^2 u = 1 - \sin^2 u$

$\cos^2 u = 1 - x^2$

$\cos u = \sqrt{1-x^2}$

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

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

$= \int u \cdot du$

$= \frac{u^2}{2} + C$

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

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

$u = \tan x$

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

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

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

$= \int u^6 \cdot du$

$= \frac{u^7}{7} + C$

$= \frac{(\tan x)^7}{7} + C$