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Mat 19/SCI01/010

(1) $\int \frac{dx}{x^2+7} = \int \frac{dx}{x^2+(\sqrt{7})^2}$

$x = \sqrt{7}\tan\theta$

$dx/d\theta = \sqrt{7}\sec^2\theta$

$dx = \sqrt{7}\sec^2\theta d\theta$

$x^2+(\sqrt{7})^2 = (\sqrt{7})^2\tan^2\theta + (\sqrt{7})^2$

$= (\sqrt{7})^2(\tan^2\theta + 1)$

Recall that $\tan^2\theta - \sec^2\theta = 1$

$\therefore = 7\sec^2\theta$

$\int \frac{\sqrt{7}\sec^2\theta d\theta}{7\sec^2\theta} = \frac{\sqrt{7}d\theta}{7} = \frac{\sqrt{7}}{7}\int d\theta$

$= \frac{\sqrt{7}}{7}[\theta] + c$

$= \sqrt{7}/7 \tan^{-1} x/7 + c$

(2) $\int \frac{dx}{x^2+64} = \int \frac{dx}{x^2+8^2}$

$x = 8\tan\theta$

$\frac{dx}{d\theta} = 8\sec^2\theta$

$dx = 8\sec^2\theta\, d\theta$

$x^2 + 8^2 = 8^2\tan^2\theta + 8^2$

$= 8^2(\tan^2\theta + 1)$

$= 64\sec^2\theta$

$$\int \frac{8\sec^2\theta\, d\theta}{64\sec^2\theta} = \int \frac{d\theta}{8} = \frac{1}{8}\int d\theta$$

$= \frac{1}{8}[\theta] + c$

$= \frac{1}{8}\tan^{-1}\frac{x}{8} + c$