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MAT 104 Classwork

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1 $\int \frac{dx}{x^2+7}$

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

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

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

$$\begin{aligned} 7+x^2 &= 7 \tan^2 \theta + 7 \\ &= 7(\tan^2 \theta + 1) \\ &= 7 \sec^2 \theta \end{aligned}$$

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

$$\frac{\sqrt{7}}{7} \int d\theta$$

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

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

2 $\int \frac{dx}{x^2+64}$

$$x = 8 \tan \theta$$

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

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

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

$$x^2+64 = 8^2 \tan^2 \theta + 8^2$$

$$x^2+64 = 8^2 (\tan^2 \theta + 1)$$

$$x^2+64 = 8^2 \sec^2 \theta$$

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

$$\frac{1}{8} \int d\theta$$

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