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DEPT.: COMPUTER SCIENCE

COURSE: MAT 104 CLASS WORK

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

Let $u = \frac{x}{\sqrt{7}} \rightarrow \frac{du}{dx} = \frac{1}{\sqrt{7}} \rightarrow dx = \sqrt{7} du$

$$\int \frac{1}{x^2+7} = \int \frac{\sqrt{7}}{7u^2+7} du$$

$$= \frac{1}{7} \int \frac{1}{u^2+1} du$$

$\int \frac{1}{u^2+1} du$ is a standard integral:

$$= \arctan(u)$$

$$\frac{1}{\sqrt{7}} \int \frac{1}{u^2+1} du$$

$$= \frac{\arctan(u)}{\sqrt{7}}$$

Recall that, $u = \frac{x}{\sqrt{7}}$

$$\therefore \frac{\arctan(u)}{\sqrt{7}} = \frac{\arctan\left(\frac{x}{\sqrt{7}}\right)}{\sqrt{7}}$$

Thus, $\int \frac{dx}{x^2+7} = \frac{\arctan\left(\frac{x}{\sqrt{7}}\right)}{\sqrt{7}} + C$

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

Let $u = \frac{x}{8} \rightarrow \frac{du}{dx} = \frac{1}{8} \rightarrow dx = 8 du$

$$\int \frac{dx}{x^2+64} = \int \frac{8}{64u^2+64} du$$

$$= \frac{1}{8} \int \frac{1}{u^2+1} du$$

Also, $\int \frac{1}{u^2+1} du$ is standard = $\arctan(u)$

$$\frac{1}{8} \int \frac{1}{u^2+1} du = \frac{\arctan(u)}{8}$$

Recall $u = \frac{x}{8}$

$$\therefore \frac{\arctan(u)}{8} = \frac{\arctan\left(\frac{x}{8}\right)}{8}$$

Thus, $\int \frac{dx}{x^2+64} = \frac{\arctan\left(\frac{x}{8}\right)}{8} + C$