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Mat 104

Find the Integral of the following

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

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

Soln

a $\int \frac{dx}{x^2+7}$ = substitute $u = \frac{x}{\sqrt{7}} \rightarrow \frac{du}{dx} = \frac{1}{\sqrt{7}} \rightarrow dx = \sqrt{7}\, du$

du: $\int \frac{\sqrt{7}}{7u^2+7} du$ simplify $= 1/\sqrt{7} \int \frac{1}{u^2+1} du = \int \frac{1}{u^2+1} du$

$= \arctan(u)$, $1/\sqrt{7} \int \frac{1}{u^2+1} du = \frac{\arctan(u)}{\sqrt{7}} = \frac{\arctan(x/\sqrt{7})}{\sqrt{7}}$

$= \frac{\arctan(x/\sqrt{7})}{\sqrt{7}} + C$

b) $\int \frac{1}{x^2+64} dx$ = substitute $u = x/8 \rightarrow du/dx = 1/8$, $dx = 8du$

$= \int \frac{8}{64u^2+64} du$, $1/8 \int \frac{1}{u^2+1} du = \int \frac{1}{u^2+1} du$

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

Unsubstitute $u = x/8$ $= \frac{\arctan(x/8)}{8}$

$\int \frac{1}{x^2+64} dx = \frac{\arctan(x/8)}{8} + C$