17/ENG05/037

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MAT 104 ~~ASSIGNMENT~~ CLASSWORK

MECHATRONICS ENGINEERING

① $\int \frac{1}{x^2+7}\,dx$

$u = \frac{x}{\sqrt{7}} \longrightarrow \frac{du}{dx} = \frac{1}{\sqrt{7}} \quad dx = \sqrt{7}\,du$

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

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

$\int \frac{1}{u^2+1}$ is a standard integral of $\arctan(u)$

$= \frac{1}{\sqrt{7}} \arctan u + C$

$u = \frac{x}{\sqrt{7}}$

$= \frac{1}{\sqrt{7}} \tan^{-1}\left(\frac{x}{\sqrt{7}}\right) + C = \frac{\tan^{-1}\left(\frac{x}{\sqrt{7}}\right)}{\sqrt{7}} + C = \frac{\sqrt{7}\tan^{-1}\left(\frac{x}{\sqrt{7}}\right)}{7} + C$

⑤ $\int \frac{1}{x^2+64}\,dx$

$u = \frac{x}{8} \longrightarrow \frac{du}{dx} = \frac{1}{8} \longrightarrow dx = 8\,du$

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

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

$= \frac{1}{8} \tan^{-1} u + C$

$= \frac{1}{8} \tan^{-1}\left(\frac{x}{8}\right) + C$

$= \frac{\tan^{-1}\left(\frac{x}{8}\right)}{8} + C$