Name: Richard

QUIZ 8 ♠

MATH 201
February 15, 2024

1. $\int \tan\left(\frac{x}{2}\right) dx = \frac{1}{1/2} \ln\left|\sec\left(\frac{x}{2}\right)\right| + C = \boxed{2\ln\left|\sec\left(\frac{x}{2}\right)\right| + C}$

2. $\int \frac{x^3-2}{x+1} dx = \int x^2 - x + 1 - \frac{3}{x+1}\, dx = \boxed{\frac{x^3}{3} - \frac{x^2}{2} + x - 3\ln|x+1| + C}$

$$
\begin{array}{r}
x^2 - x + 1 \\
x+1 \overline{)\, x^3 + 0x^2 + 0x - 2} \\
\underline{x^3 + x^2} \\
-x^2 + 0x \\
\underline{-x^2 - x} \\
x - 2 \\
\underline{x + 1} \\
-3
\end{array}
$$

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1. $\int \sec(\pi x)\, dx = \boxed{\frac{1}{\pi} \ln\left|\sec(\pi x) + \tan(\pi x)\right| + C}$

2. $\int \frac{x}{x^4+2x^2+1} dx = \int \frac{x}{(x^2+1)^2} dx = \int \frac{1}{u^2} \frac{1}{2} du = \frac{1}{2}\int u^{-2} du$

$u = x^2 + 1$
$du = 2x\, dx$
$\frac{1}{2} du = x\, dx$

$= \frac{1}{2} \frac{u^{-1}}{-1} + C = \frac{-1}{2u} + C$

$= \frac{-1}{2(x^2+1)} + C$

$= \boxed{\frac{-1}{2x^2+2} + C}$

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1. $\int \cot(\pi x)\,dx =$ $\boxed{\frac{1}{\pi}\ln|\sin(\pi x)| + C}$

2. $\int \frac{1}{x^2+2x+5}\,dx = \int \frac{1}{x^2+2x+1+4}\,dx = \int \frac{1}{(x+1)^2+2^2}\,dx$

$u = x+1$, $du = dx$

$= \int \frac{1}{u^2+2^2}\,du = \frac{1}{2}\tan^{-1}\left(\frac{u}{2}\right) + C$

$= \boxed{\frac{1}{2}\tan^{-1}\left(\frac{x+1}{2}\right) + C}$

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1. $\int \csc(5x)\,dx =$ $\boxed{-\frac{1}{5}\ln|\csc(5x)+\cot(5x)| + C}$

2. $\int \frac{dx}{x^{-1}+1} = \int \frac{dx}{\frac{1}{x}+1} = \int \frac{dx}{\frac{1+x}{x}} = \int \frac{x}{1+x}\,dx$

$u = 1+x$, $x = u-1$, $du = dx$

$= \int \frac{u-1}{u}\,du = \int 1 - \frac{1}{u}\,du$

$= u - \ln|u| + C$

$= 1 + x - \ln|1+x| + C = \boxed{x - \ln|1+x| + C}$

The 1 and C combine into a single C