5.1 Integration with LN

$\int \frac{1}{x}\,dx = \boxed{\ln|x| + C}$

reverse

Why doesn't the power rule work?

$\cancel{\int x^{-1+1}\,dx}$ $\frac{d}{dx}\ln x$

Warm-up: 5.5.22

1) Get out packet and go to page 21. Complete #1,2 and 5 for warm-up.

2) ***SKILLS CHECK IS ON MONDAY OVER U-SUBSTITUTION AND PARTS.***

Tomorrow Room 2006

Assignment pg. 27 packet!

1. pg. 21 $\int \underbrace{x}_{u} \underbrace{\sin x\,dx}_{dv}$ $u = x$ $du = dx$

$v = -\cos x$ $dv = \sin x\,dx$

$\int u\,dv = uv - \int v\,du$

$= -x\cos x - \int -\cos x\,dx$

$= \boxed{-x\cos x + \sin x + C}$

2. $\int \underbrace{x}_{u} \underbrace{\cos 5x\,dx}_{dv}$ $u = x$ $du = dx$

$v = \frac{1}{5}\sin 5x$ $dv = \cos 5x\,dx$

$= x \cdot \frac{1}{5}\sin 5x - \int \frac{1}{5}\sin 5x\,dx$

$u = 5x$ $du = 5\,dx$

$\frac{1}{5}\int \cos u\,du$

$\frac{1}{5}\sin 5x$

$u = 5x$ $du = 5\,dx$

$= \frac{1}{5}x\sin 5x$

$\frac{1}{5}\int \sin u\,du$

$\frac{1}{5}\int \sin 5x\,dx$

$\frac{1}{5}\left(-\frac{1}{5}\cos 5x\right)$

$\boxed{= \frac{1}{5}x\sin 5x + \frac{1}{25}\cos 5x + C}$

$f \cdot g$

$\frac{1}{5}\sin 5x + 5\cos 5x \cdot \frac{1}{5}x + -\frac{1}{5}\cdot 5\sin 5x$

$\cancel{\frac{1}{5}\sin 5x} + x\cos 5x - \cancel{\frac{1}{5}\sin 5x}$

$\boxed{x\cos 5x}$

5. $\int \underset{u}{x}\, \underset{dv}{\csc^2 x\, dx}$

$u = x \quad du = dx$

$dv = \csc^2 x\, dx$

$v = -\cot x$

$= x\cot x - \int \boxed{\cot x\, dx}$

$= -x\cot x \cancel{\int \frac{\cos x}{\sin x} dx}$

$\int \frac{2}{x} dx = \int 2 \cdot \frac{1}{x} dx$

$= \boxed{2\ln|x| + C}$

$\int \frac{1}{4x-1} dx = \int (4x-1)^{-1} dx$

$u = 4x-1$

$du = 4\,dx$

$= \frac{1}{4}\int u^{-1} du$

$= \frac{1}{4}\ln|u| + C$

$= \frac{1}{4}\ln|4x-1| + C$

If the expression is raised to the -1 power, the answer will be ln.

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

$u = x^2+1$

$du = 2x\,dx$

$= \frac{1}{2}\int u^{-1} du = \frac{1}{2}\ln|u| + C$

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

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

$u = x^3+x$

$du = 3x^2+1\, dx$

$\int \sin x (\cancel{\cos x})^{-2}$

$\int \frac{\sin x}{\cos^2 x} dx$

$u = \cos x$

$du = -\sin x\, dx$

$-\int u^{-2+1} du = -(-u^{-1}) + C$

$u^{-1} + C$

$\boxed{\cos^{-1} x + C}$

$\int \frac{\sec^2 x}{\tan x} dx$

$u = \tan x$

$du = \sec^2 x\, dx$

$\int u^{-1} du = \ln|u| + C$

$\ln|\tan x| + C$

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

$\int \frac{1}{x \ln x} dx$

$u = \ln x$

$du = \frac{1}{x} dx$

$\int u^{-1} du =$

$\ln|u| + C$

$\ln|\ln x| + C$

$\int \frac{\ln x}{x} dx$

$u = \ln x$

$du = \frac{1}{x} dx$

$\int u\, du =$

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

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