U-sub example:

$\int 32x \sqrt[5]{4x-2}\, dx$

Let $u = 4x-2 \iff u+2 = 4x$

$\frac{du}{dx} = 4$ $\qquad \frac{u+2}{4} = x$

$du = 4 \cdot dx$

$\frac{du}{4} = dx$

$\int 32x \cdot u^{1/5} dx$

$\int 32x \cdot u^{1/5} \cdot \frac{du}{4}$

$\int 8x \cdot u^{1/5} \cdot du$

$\int 8\left(\frac{u+2}{4}\right) \cdot u^{1/5} \cdot du$

$\int (2u+4) u^{1/5}\, du$

$\int 2u^{6/5} + 4u^{1/5}\, du$

$2 \cdot \frac{5}{11} u^{11/5} + 4 \cdot \frac{5}{6} u^{6/5}$

$\frac{10}{11} u^{11/5} + \frac{10}{3} u^{6/5} + C$

$\frac{10}{11}(4x-2)^{11/5} + \frac{10}{3}(4x-2)^{6/5} + C$

Reverse Chain Rule

$$\int \frac{x}{\sqrt{4x^2+1}}\,dx$$

$$\frac{1}{8}\int 8x\cdot(4x^2+1)^{-1/2}\,dx$$

$$\frac{1}{8}\int 8x\cdot(4x^2+1)^{-1/2}\,dx$$

$$\frac{1}{8}\left[\frac{(4x^2+1)^{1/2}}{1/2}+c\right] \Rightarrow \frac{1}{8}\left[2(4x^2+1)^{1/2}+c\right]$$

$$\boxed{\frac{1}{4}(4x^2+1)^{1/2}+c}$$

When finished:

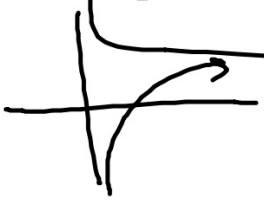
- turn into basket
- work on book work until everyone's finished

Advanced Antiderivatives

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

$$\int x^{-1}\cdot dx = \int \frac{1}{x}\cdot dx = \ln x + C$$

$$\frac{d}{dx}\ln x = \frac{1}{x}$$



Example

$$\int -\frac{8x^3}{x^4+2}\,dx$$

$$\int -8x^3 \cdot (x^4+2)^{-1} \cdot dx$$

$$-2 \int 8x^3 \cdot \frac{1}{x^4+2} \cdot dx$$

$4x^3$

$$-2 \int 4x^3 \cdot \frac{1}{x^4+2} \cdot dx = -2 \cdot \ln\left|x^4+2\right| + C$$

u

4.

$$3\cdot\int \tfrac{1}{3}\,15\sec 5x\cdot\tan 5x\,(\sec 5x)^{1/3}\cdot dx$$

$\sec 5x\cdot\tan 5x\cdot 5$

$5\cdot\sec 5x\cdot\tan 5x$

$$3\int 5\cdot\sec 5x\cdot\tan 5x\cdot(\sec 5x)^{1/3}\cdot dx$$

u

$$3\cdot\ \frac{3}{4}(\sec 5x)^{4/3} = \boxed{\frac{9}{4}(\sec 5x)^{4/3}+C}$$

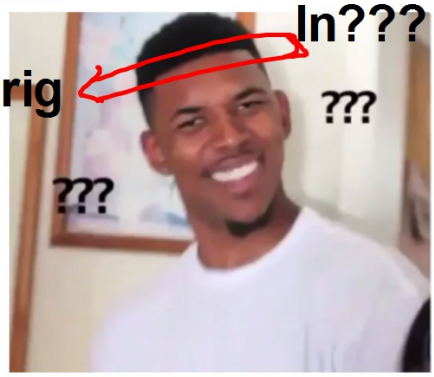
Why the heck...what....

$$\int \tan x\,dx = -\ln|\cos x| + C$$

$$\int \cot x\,dx = \ln|\sin x| + C$$

$$\int \sec x\,dx = \ln|\sec x + \tan x| + C$$

$$\int \csc x\,dx = -\ln|\csc x + \cot x| + C$$



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

$$\int \tan(\theta)\, d\theta$$

$$\int \frac{\sin\theta}{\cos\theta}\, d\theta$$

$$-\int -\sin\theta \frac{1}{\cos\theta}\, d\theta$$

$$-\int -\sin\theta \frac{1}{\cos\theta} \cdot d\theta \Rightarrow -\ln|\cos\theta| + C$$

$\frac{1}{\cos\theta} = \sec\theta$

$$\int 15x^4 \cdot \frac{1}{\sqrt{9-9x^{10}}} \cdot dx$$

$$\int 15x^4 \cdot \frac{1}{\sqrt{3^2-(3x^5)^2}} \cdot dx$$

Homework:

p. 302 #47-50 (I-A2b)
p.251 #35-42 (I-A3)
Worksheet #1-10

Monday assess:
u sub
finding C
advanced antiderivatives
(new skill: I-A1b)