Agenda:
Review
U-substitution
Finding C

Add to booklets:

Reverse chain rule:

$$\int g'(x) * f'(g(x)) \, dx = f(g(x)) + C$$

Review for test:

Monday's assess:

- basic anti deriv
- linear approx.
- related rates (simple one)

$$\int \sqrt[4]{x^3} + \csc^2 x + 2x^2 \, dx =$$

$$\int x^{3/4} + \csc^2 x + 2x^2 \, dx$$

$$+C$$

$$\int 5 \, d\theta = 5\theta + C$$

Assessment

When finished, do: p. 301 #33-35, 39-40

$$\frac{1}{4}\int 4 \cdot 3x^2 \cdot \cos(4x^3)\, dx$$

$\underline{12x^2}$

Answers:

33. -cos(πx)+C
34. -1/4 cos(4x) + C
35. 1/8 sin(8x) + C

39. 1/4 (sin 2x)^2+C
40. 2/3 (tan x)$^{3/2}$ + C

$$\frac{1}{2}\int 2\cos 2x\,(\sin(2x))^1\,dx$$

U-Substitution

Used when reverse chain rule fails.

$$\int 2x^3\sqrt{x^2+1}\,dx$$

$$\boxed{\text{Let } u = x^2+1} \Leftrightarrow u-1 = x^2$$

$$\int 2x^3\cdot(x^2+1)^{1/2}\,dx$$

$$\frac{du}{dx} = 2x \; *$$

$$\frac{du}{2x} = \frac{\cancel{2x}\cdot dx}{\cancel{2x}}$$

$$\frac{du}{2x} = dx \; *$$

$$\int 2x^3\cdot(u)^{1/2}\,dx$$

$$\Updownarrow$$

$$\int 2x^3\cdot(u)^{1/2}\cdot\frac{du}{2x}$$

$$\int \cancel{2}x^3\,\frac{1}{\cancel{2x}}\cdot(u)^{1/2}\,du$$

$$\int x^2\,(u)^{1/2}\,du$$

$$\int (u-1)\cdot u^{1/2}\,du$$

$$\int u^{3/2} - u^{1/2}\,du$$

Let $u = x^2+1$

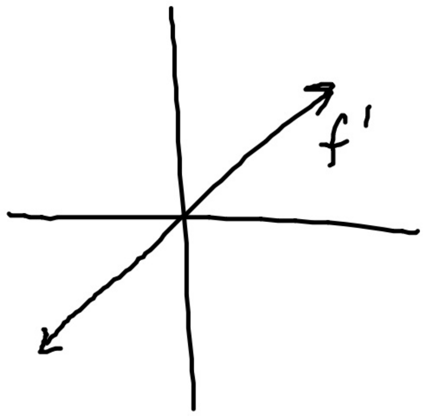
$$\frac{2}{5}u^{5/2} - \frac{2}{3}u^{3/2} + C$$

$$\frac{2}{5}\left(x^2+1\right)^{5/2} + \frac{2}{3}\left(x^2+1\right)^{3/2} + C$$

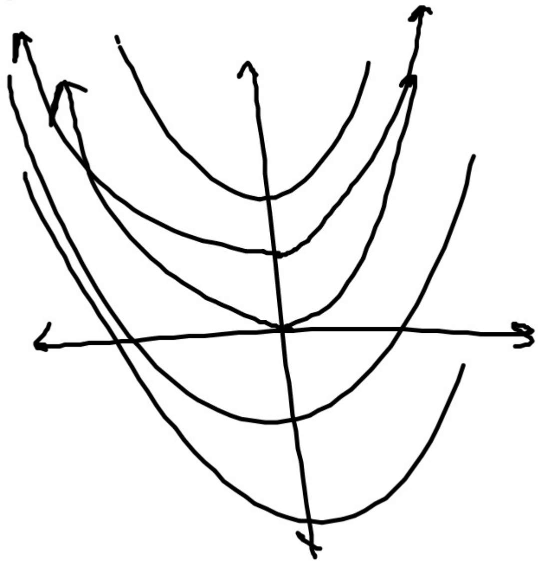
Finding C

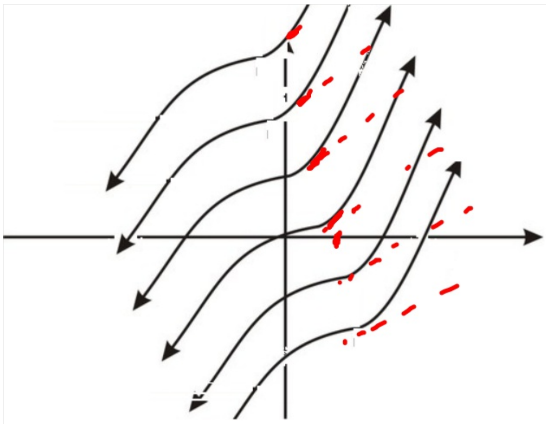
What is the solution to an indefinite integral? a family of functions.

$$\int f'(x)\,dx = f(x) + C$$



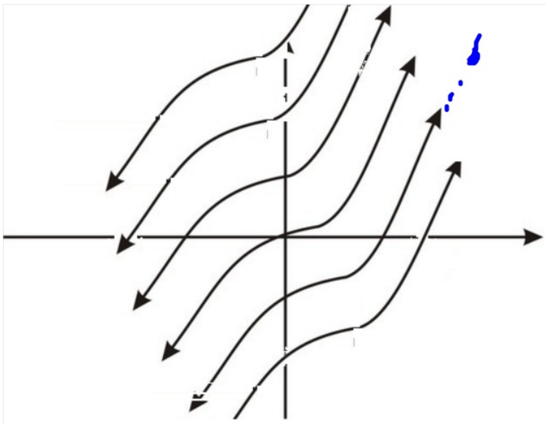
$\Rightarrow$





Well which one is it??

$$\int f'(x)\,dx = f(x) + C$$



You need a single point...

Example:
A car's acceleration after time t=0 can be modeled by the linear function $a(t) = 4t+2$ m/s^2. Find its position function.

$\frac{d}{dx}$ pos
velocity
accel.

$a(t) = 4t+2$

$v(t) = \int a(t)\,dt$

$\int 4t+2\,dt$

$*\,v(t) = 2t^2+2t+C$

Additional info:
$v(1) = 6$ m/s

$v: (1, 6)$

$6 = 2(1)^2+2(1)+C$

$6 = 2+2+C$

$6 = 4+C \Rightarrow \underline{C=2}$

$v(t) = 2t^2+2t+2$

s(3) = 35 m

$\int v(t)\,dt = s(t) \Rightarrow \int 2t^2+2t+2\,dt$

$s(t) = \frac{2}{3}t^3+t^2+2t+C \leftarrow (3, 35)$

$35 = \frac{2}{3}(3)^3+3^2+2(3)+C$

$35 = \frac{2}{3}\cdot 27+9+6+C$

$35 = 18+9+6+C$

$27+6$

33

$35 = 33+C$

$-33 \quad -33$

$2 = C$

$\boxed{s(t) = \frac{2}{3}t^3+t^2+2t+2}$

U-sub homework: p. 302 47-50 (I-A2b)

Finding C hw: p. 251: 35-42 (I-A3)