$$\frac{d}{dx}\sin(x) = \cos(x)$$

$$\frac{d}{dx}\cos(x) = -\sin(x)$$

Goals

- Trig Derivatives Sin & Cos
- *Product Rule*

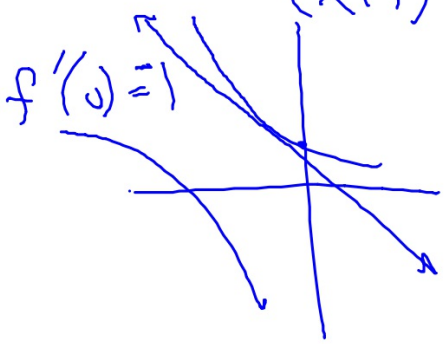
32.

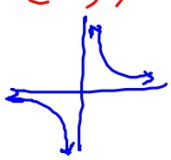
$$f(x) = \frac{1}{x+1}$$

$$f(x)\,(x+1)^{-1}$$

$$f'(x) = -1(x+1)^{-2} \cdot 1$$

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





$$y - 1 = -1(x - 0)$$

$$\boxed{y = -x + 1}$$

$$f = [\quad]^n$$

$$f = n[\quad]^{n-1} \cdot [\quad]'$$

derivative of the "red"

ex • $y = 3\cos x$ → $y' = 3 \cdot \frac{d}{dx}\cos x$

$y' = 3 \cdot -\sin(x)$

$\frac{dy}{dx} = y' = -3\sin x$

$\frac{1}{2}\cdot\sin(t) \to \frac{1}{2}\cdot\cos(t)$

ex • $f(t) = \frac{\sin(t)}{2}$ $f'(t) = \frac{\cos(t)}{2}$

ex $f(x) = x + \sin(x)$

$f'(x) = 1 + \cos(x)$

Sum/Diff Rule.

$\frac{d}{dx}\left(f(x)+g(x)\right) = f'(x) + g'(x)$

(also works for subtraction)

Constant multiple rule.

$\frac{d}{dx}\, c\cdot f(x) = c\cdot f'(x)$

where c is some number.

"you can factor out the coeff."

★ Challenge ★

$y = \sin(3x^2)$

$y' = \cos(3x^2)\cdot 6x$!!

✱ Product Rule ✱ p. 117

$$\frac{d}{dx}\Big(f(x)\cdot g(x)\Big) = f(x)\cdot g'(x) + g(x)\cdot f'(x)$$

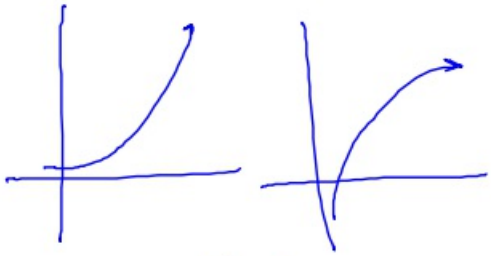
ex/ $f(x) = 2x^2 \cdot \sin(x)$

$f'(x) = 2x^2 \cdot \cos(x) + \sin(x) \cdot 4x$

ex/ $f(x) = (3 - 4x^2)(9x - 2x^3)$

$f' = (3-4x^2)(9-6x^2) + (9x-2x^3)(-8x)$

f'' → concavity



ex/ $y = 2x \cdot \cos(x) + 3x^2$

$\frac{dy}{dx} = 2x \cdot -\sin(x) + \cos(x) \cdot 2 + 6x$

$-2x\sin(x) + 2\cos(x) + 6x$

$-2(x \cdot \sin(x) - \cos(x) - 3x)$