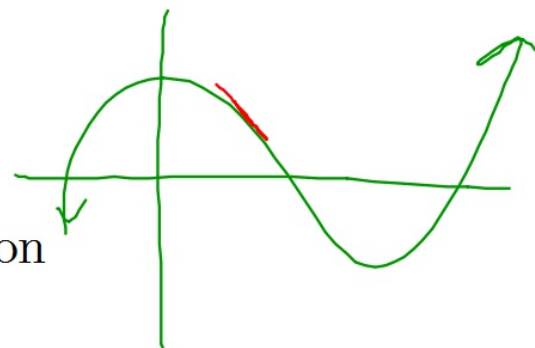


Good afternoon: Warm up in notes (write the question this time)

$f(x)=3-8x$  Find  $\lim_{\Delta x \rightarrow 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$  with as little effort as possible.

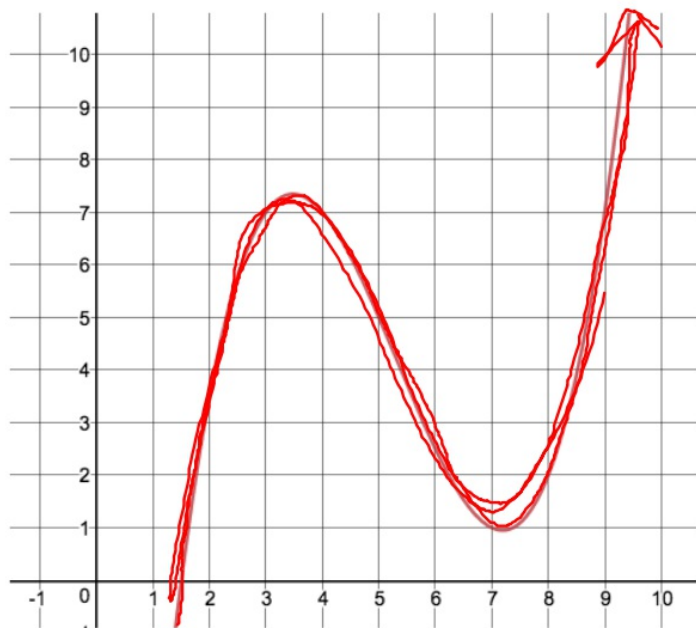
$$f'(x) = -8$$

because a derivative is the slope of a function



What is this good for?

A particular investment's value as a function of time can be modeled by  $v(t) = \frac{t^3}{4} - 4t^2 + \frac{75}{4}t - 20$  where  $t$  is measured in months since opening and  $v$  is measured in thousands of dollars.



What is the value of the portfolio exactly 5 months into the investment?

$$v(5) = \frac{5^3}{4} - 4 \cdot 5^2 + \frac{75}{4} \cdot 5 - 20 = \$5000$$

How fast is it losing money then?

Discovering a pattern among polynomials and their derivatives

What's the derivative of something like....

$$\frac{t^3}{4} - 4t^2 + \frac{75}{4}t - 20$$

Practice: find  $dy/dx$  for each.

$$y = 3x^3 \Rightarrow \frac{dy}{dx} = 3 \cdot (3x^2) = \underline{9x^2}$$

$$f(x) = -2x^5 = -2 \cdot 5x^4 \\ = \boxed{-10x^4}$$

$$y = 5x^3 - 2x' + 3 =$$

$$\downarrow \quad \downarrow \\ 15x^2 - 2 + 0$$

$$\underline{15x^2 - 2}$$

## Common Sense Derivative Properties (add to booklet)

$$\frac{d}{dx}c = 0 \quad (\text{where } c \text{ is a constant}) \quad (\text{to do Friday})$$

$$\frac{d}{dx}cx = c \quad (\text{where } c \text{ is a constant})$$

$$\frac{d}{dx}[c * f(x)] = c * f'(x) \quad [\text{can “factor out” a constant}]$$

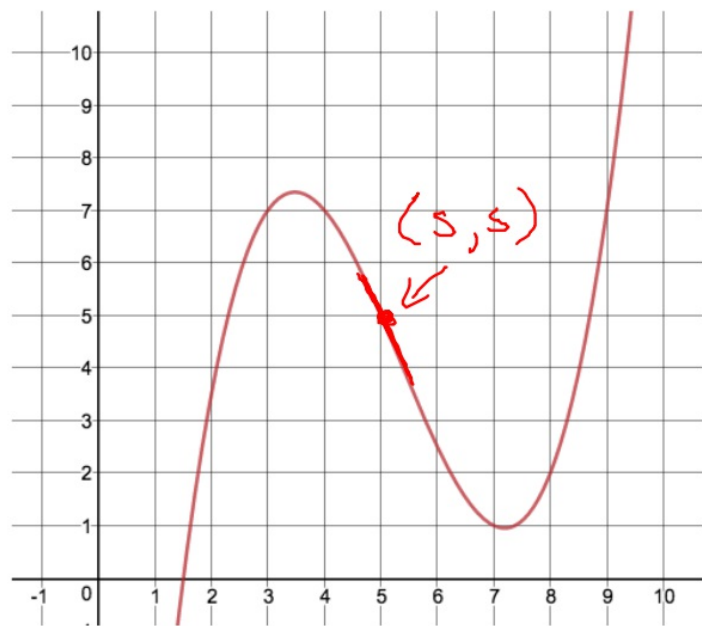
$$\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$$

[derivative of a sum/diff is the sum/diff of derivatives]

Revisiting...

A particular investment's value as a function of time can be modeled by

$v(t) = \frac{t^3}{4} - 4t^2 + \frac{75}{4}t - 20$  where  $t$  is measured in months since opening and  $v$  is measured in thousands of dollars.



What is the value of the portfolio exactly 5 months into the investment?

How fast is it losing money then?

$$v'(5) = ?$$

$$v'(t) = \frac{3}{4}t^2 - 8t + \frac{75}{4}$$

$$v'(5) = -2.5$$

$\$-2,500/\text{month}$