

thurs. wk 3

today: 3.1 (Derivative)

warm-up

$$50.5 = 25 - 5$$

Determine the given one-sided limit. Express the limit, if it exists, exactly in decimal form.

$$\lim_{x \rightarrow 5^-} \frac{9x^2 - 49x + 20}{x^2 - 25} = \frac{9x^2 - 45x - 4x + 20}{(x-5)(x+5)} = \frac{9x(x-5) - 4(x-5)}{(x-5)(x+5)} = \frac{(x-5)[9x-4]}{(x-5)(x+5)}$$

$$\lim_{x \rightarrow 5^-} \frac{9x-4}{x+5} \stackrel{\text{d.s.}}{=} \frac{9 \cdot 5 - 4}{5+5} = \frac{41}{10}$$

$$\lim_{x \rightarrow 5^-} \frac{9x^2 - 49x + 20}{x^2 - 25} = \boxed{4.1}$$

Factor 4 AC

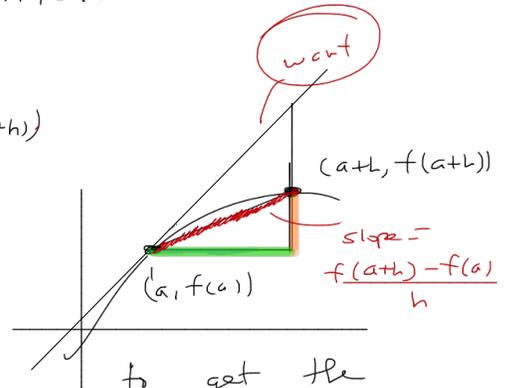
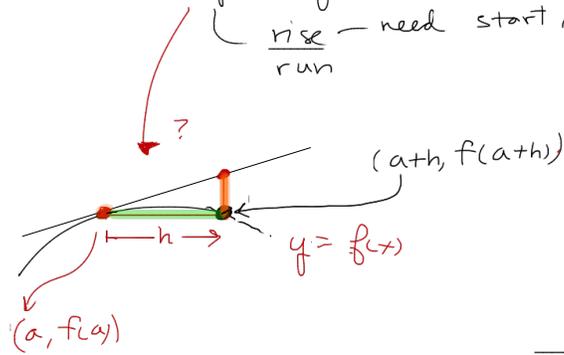
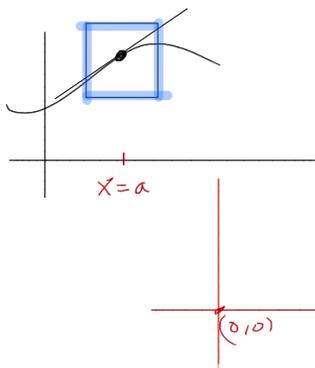
180

$$45 \cdot 4 = 180$$

Hint: factor easy one 1st $(x^2 - 25) = (x-5)(x+5)$
look for one of these factors in other poly

The Derivative

We want to know the slope of curves @ a point



to get the slope we want, decrease h

We call

$$f'(a) \text{ the derivative of } f \text{ @ } a$$

$$f'(a) = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$$

(sometimes written

$$f'(a) = \lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$$

sub $x = a+h$

Note 7

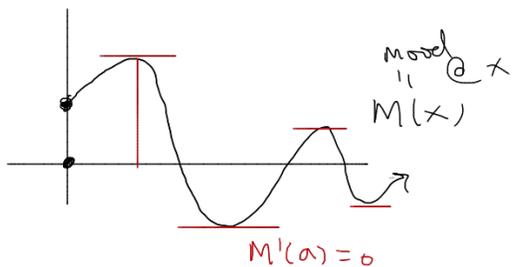
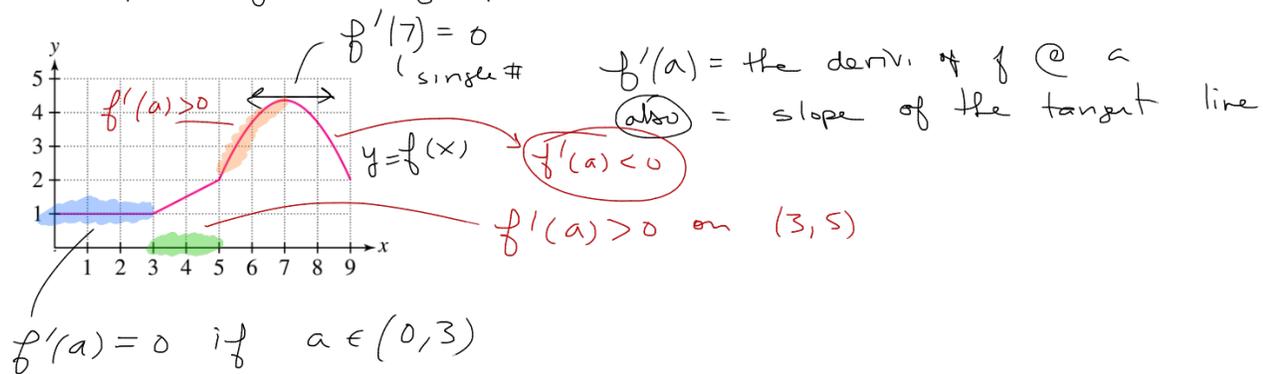
On wed, wk 3 we 1

① Let $f(x) = 2x^2$, computed $f'(x) = 4x$
derivative of f

② Let $f(x) = \sqrt{x}$, computed $f'(x) = \frac{1}{2\sqrt{x}}$

③ Let $f(x) = \frac{1}{x}$, got $f'(x) = -\frac{3}{x^2}$

Ex Interpret $f'(x)$ graphically



$M'(x) > 0 \Rightarrow$ mood is increasing

$M'(x) < 0 \Rightarrow$ mood is getting worse

$M'(x) = 0$ — mood is changing

~ Peaks / ^{Bottom} Valley $\Leftrightarrow M'(x) = 0$

Question 9 of 12

(*)

Suppose that f is a function such that $f(3+h) - f(3) = 2h^2 + 3h$
 $= h(2h+3)$

Calculate $f'(3)$.
 (Give your answer as a whole or exact number.)

$$f'(3) = \lim_{h \rightarrow 0} \frac{f(3+h) - f(3)}{h}$$

want
it is

$$\frac{f(3+h) - f(3)}{h} = 2h+3$$

equal to

$f'(3) =$

(#)

Calculate the slope of the secant line through $(3, f(3))$ and $(5, f(5))$.

(Give your answer as a whole or exact number.)

$$\frac{f(5) - f(3)}{5 - 3}$$

key: given formula true for all h

s. $f(5) = f(3+h)$ if $h=2$ (sub into $h=2$)

$$f(5) - f(3) = 2 \cdot 2^2 + 3 \cdot 2$$

useful in (#)