Monday, Oct. 10 - Fall '22
Lecture #18

Announcements / Reminders

* Wiley Plus #6 due Wed (21, 22)
* Quiz #6 Thurs (21, 22)
* Exam 2 is Wed, Oct 26
  (not next week)

Classroom Expectations:

→ The purpose of lecture is to
  (1) introduce you to each topic so you have some familiarity when you start homework later
  (2) give you a chance to try some problems in groups

→ Things that impede that:
  * Frequent chatting
  * Being distracted by your phone
  * Doing Wiley Plus while sitting in class

It's rude to me, to yourself, and to your classmates.

Rules:

If you would like to attend lecture, you agree to the following:

(1) Phones away, not out from 11am to 11:50am. (talk to me if there is a reason otherwise)

(2) No computers unless you are using them to follow along with the textbook or take notes.

(3) No chatting

Including during group work.

* I will not be taking attendance anymore. If you cannot abide by these three things, you don't need to come. (Obviously that's a bad idea, but it's your decision...) *

Finishing 2.2

Reminder:

$f'(a) > 0$: graph is going up at $x=a$

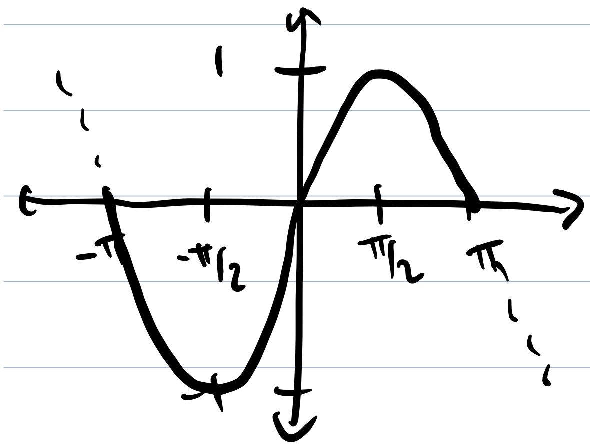
$f'(a) < 0$: graph is going down at $x=a$

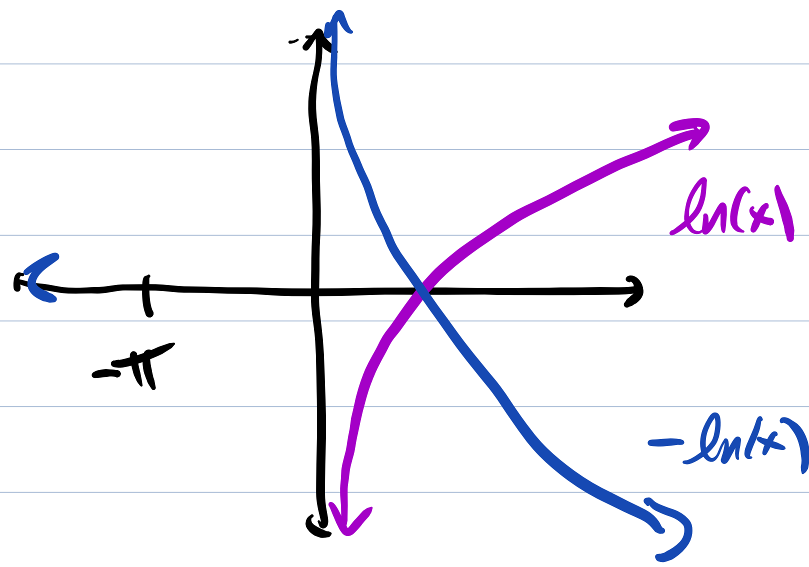
$f'(a) = 0$: graph is flat at $x=a$

(Imagine you're on a rollercoaster.)

For each function f and each point a, is $f'(a)$ pos, neg, 0, or DNE?

a\f	x^2+3	$5x+2$	2^x	$(\frac{1}{2})^x$	$\sin(x)$	$-\ln(x)$
$-\pi$	−	+	+	−	−	DNE
-1	−	+	+	−	+	DNE
0	0	+	+	−	+	DNE
1	+	+	+	−	+	−
$1.5 \approx \pi/2$	+	+	+	−	0	−

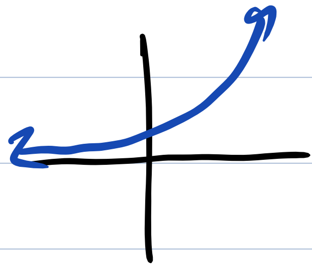




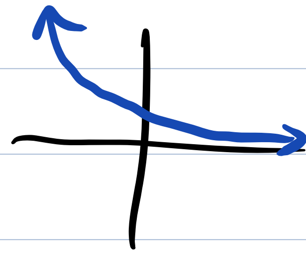
$\left(\frac{1}{2}\right)^x$ Section 1.2

$P_0 \cdot a^x$

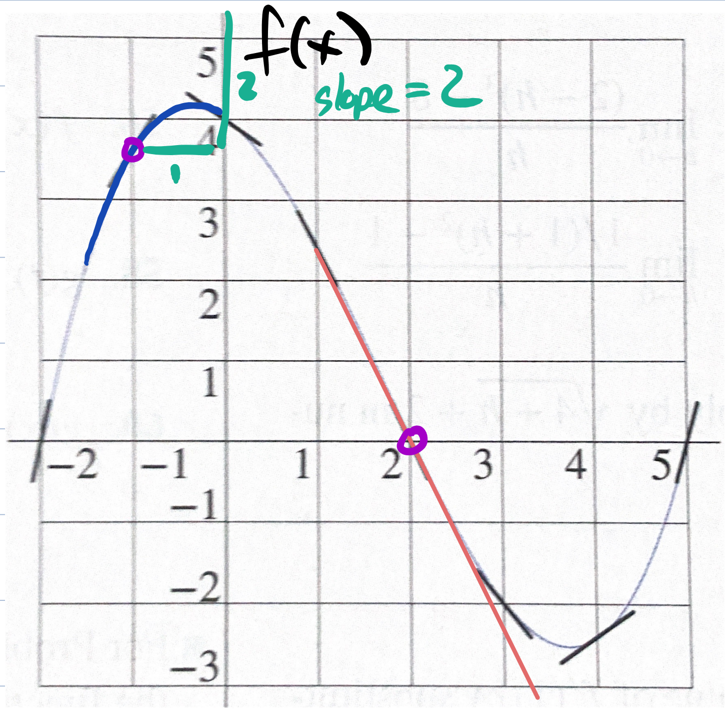
$a > 1$: exp. growth



$0 < a < 1$: exp. decay



Section 2.3 – The Derivative Function



Ex: Estimate the derivative of $f(x)$ at $x = -2, -1, 0, 1, 2, 3, 4, 5$

$f'(-1) \approx 2$

x	-2	-1	0	1	2	3	4	5
$f(x)$	0	3.5	4	2.5	0	-2	-2.5	0
$f'(x)$	4.5	2	-0.5	-2.5	-2.5	-2	1	3.5

The derivative function:

Let $f(x)$ be a function. Its derivative is a new function that we call $f'(x)$.

Input: some x-value $x=a$

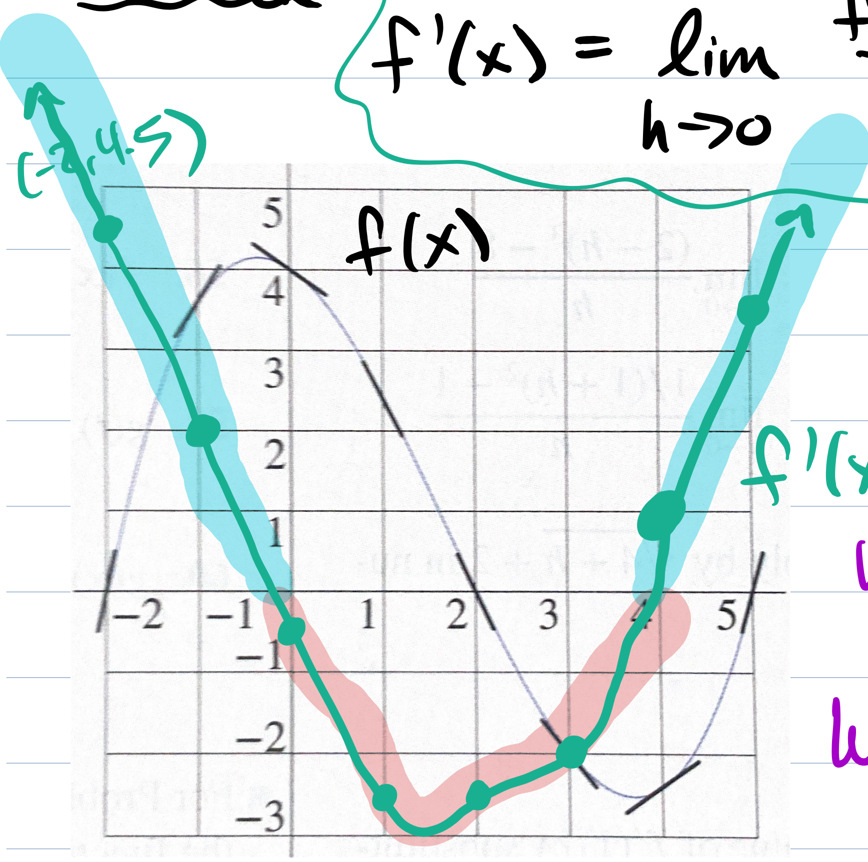
Output: [the slope of the tangent line of $f(x)$ at $x=a$]

$a \longrightarrow \boxed{f} \longrightarrow f(a)$

$a \longrightarrow \boxed{f'} \longrightarrow$ [slope of $f(x)$ at $x=a$] $= f'(a)$

Formula:

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$



Ex: Draw $f'(x)$ on the same axes.

When $f'(x) > 0$, $f(x)$ is increasing

When $f'(x) < 0$, $f(x)$ is decreasing

First Derivative Formulas:

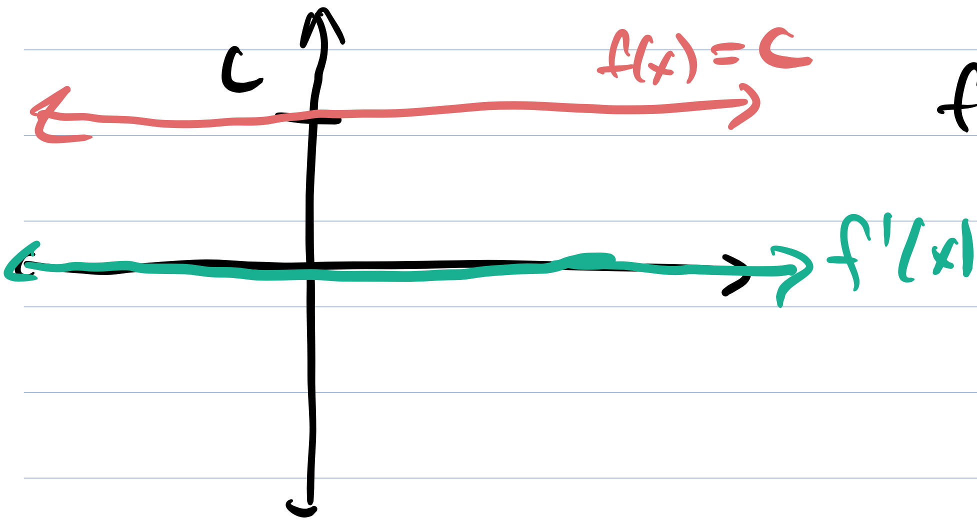
Let $f(x)$ be a constant function.

$$f(x) = C$$

for some # C.

What is $f'(x)$?

$f'(x) = 0$ for all x.



Let $f(x)$ be a line: $f(x) = m \cdot x + b$

$f'(x) = m$