Math 1431

Jeff Morgan
jmorgan@math.uh.edu
651 PGH
Office Hours: 11:00-Noon MWF

http://www.math.uh.edu/~jmorgan/Math1431
tinyurl.com/math1431
@morgancalculus

Access Codes were due at 12:01am today.

EMCF05 was due this morning at 9:00am.

Homework 2 is due Today in lab/workshop.

Poppers start today.

Quiz 1 expires tonight at 11:59 pm.

Video Help was posted for Sections 2.5 and 2.6.

We will finish Chapter 2 today, and start Section 3.1.
We will skip the Extreme Value Theorem in Section 2.6, and talk about it later when we need it.

Alpha Lambda Delta Honor Society
Movie Night

Sept. 13

Free to everyone!!

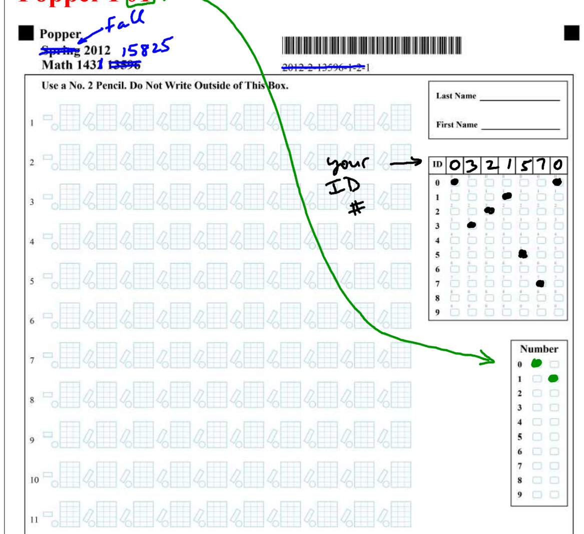
Cougar Village Rm. N111.
Snacks will be provided!

Time?

$\boxed{\text{6:00 pm}}$

:)

Popper P01



Popper P01

Don't write 1

1. $1 + 2 = 3$

3

1

2

2. The answer is -17.

-17

3. The answer is -2.1356.

-2.1356

Popper P01

4. The answer is $-23/421$

-23/421

5. The answer is 0.5.

0.5

or

.5

or if decimal is not requested

1/2

Popper P01

6. $\lim_{u \to 0} \frac{\sin(u)}{u} = 1$

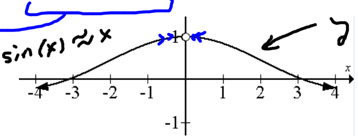
7. $\lim_{x \to 0} \frac{\sin(2x)}{3x} = \frac{2}{3}$

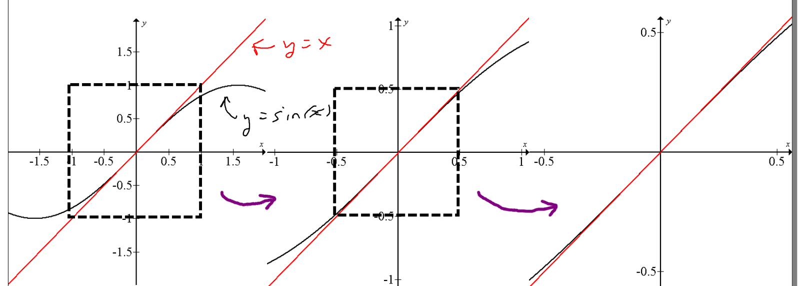
Recall: $\lim_{x \to 0} \frac{\sin(x)}{x} = 1$ **What does this mean?**

$\frac{\sin(x)}{x} \approx 1$ when $x \approx 0$

$\sin(x) \approx x$

$y = \frac{\sin(x)}{x}$

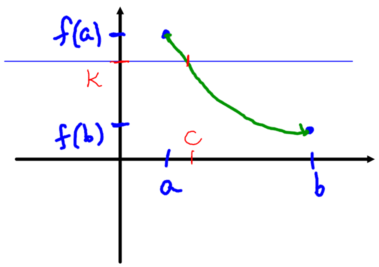




The Intermediate Value Theorem
(common sense for continuous functions)

If $f(x)$ is a continuous function on the interval $[a,b]$ and K is a value between $f(a)$ and $f(b)$, then there is ~~a~~ at least one value c between a and b so that $f(c) = K$.

$f(x)$ is continuous on $[a,b]$.



$f(c) = K$

Show there is a value of x between 1 and 3 so that $-3x^3 + 2x^4 = 7$

(a good place to use the Intermediate Value Theorem)

Set $f(x) = -3x^3 + 2x^4$.

$f(x)$ is a polynomial, so $f(x)$ is continuous on $[1,3]$.

Can we solve $f(x) = \boxed{7}$ on $[1,3]$?

Use I.V.Thm: $f(1) = -1$

$f(3) = -81 + 2\cdot 81 = 81$

7 is between $f(1) = -1$ and $f(3) = 81$.

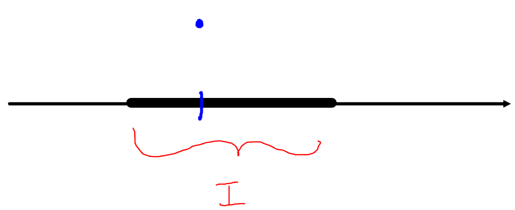
$\therefore$ There is a value c btwn 1 and 3 so that $f(c) = 7$.

i.e. $f(x) = 7$ has a sol'n on $[1,3]$.

Corollary to the Intermediate Value Theorem: Suppose a function f is continuous on an interval I and $f(x)$ is not 0 at any value x in I.

If $f(c) > 0$ at some point c in I, then $f(x) > 0$ at every x in I.

If $f(c) < 0$ at some point c in I, then $f(x) < 0$ at every x in I.



Solve the inequality $\frac{1}{x-1} + \frac{1}{x-2} < 0$

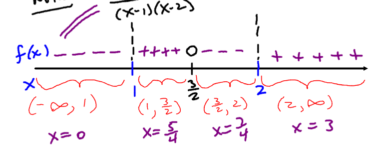
(a good place to use the Intermediate Value Theorem)

$$\frac{x-2+x-1}{(x-1)(x-2)} < 0$$

$$\underbrace{\frac{2x-3}{(x-1)(x-2)}}_{\text{rational function}} < 0 \qquad f(x) = \frac{2x-3}{(x-1)(x-2)}$$

cont. except at $x=1$ and $x=2$.

Note: $\frac{2x-3}{(x-1)(x-2)} = 0$ iff $x = \frac{3}{2}$.

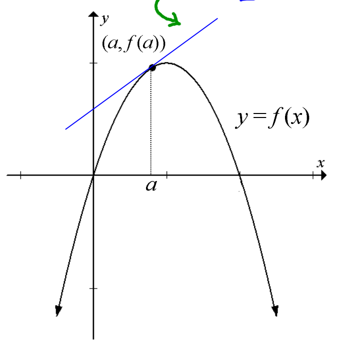


$f(0) = \frac{-}{(-)(-)} = -$ $\quad f(\frac{5}{4}) = \frac{-}{(+)(-)} = +$ $\quad f(\frac{7}{4}) = \frac{+}{(+)(-)} = -$ $\quad f(3) = \frac{+}{(+)(+)} = +$

Sol'n: $(-\infty, 1) \cup (\frac{3}{2}, 2)$

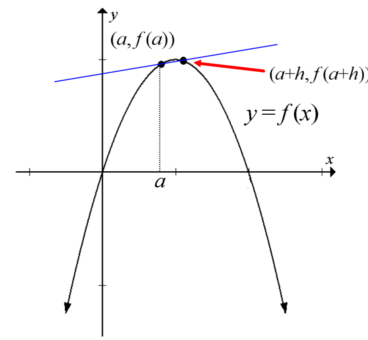
An Introduction to Derivatives: How can we approximate the slope of the tangent line to the graph at $x = a$?

I.



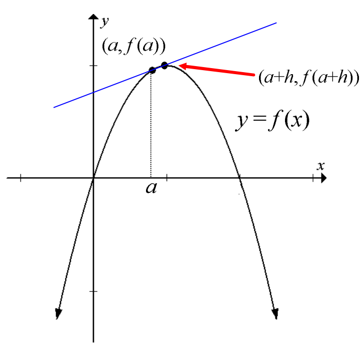
We can approximate the tangent line to the graph at $x = a$ by using a secant line.

II.



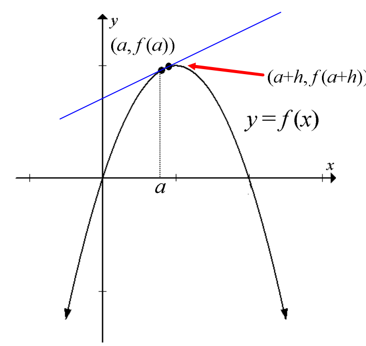
We can improve this approximation by making h smaller.

III.



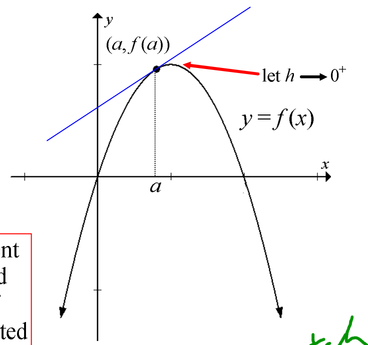
The approximation will continue to improve as we make h even smaller.

IV.



If the limit exists, then we can find
the slope of the graph at $x = a$ by taking a limit.

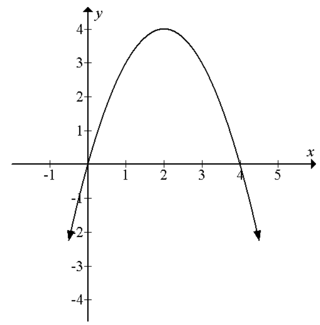
V.



The slope of the tangent line at $x = a$ is called **the derivative** of f at $x = a$, and it is denoted by $f\,'(a)$.

Watch the video.

Example: Give the slope of the tangent line to the graph of $f(x) = 4x - x^2$ at $x = 1$.



Watch the video.