Sorry about the spreadsheet debacle on Wednesday!

The Math Learning Center

`http://www.math.uic.edu/undergrad/mslc/`

Other ways to get help:

- TA.

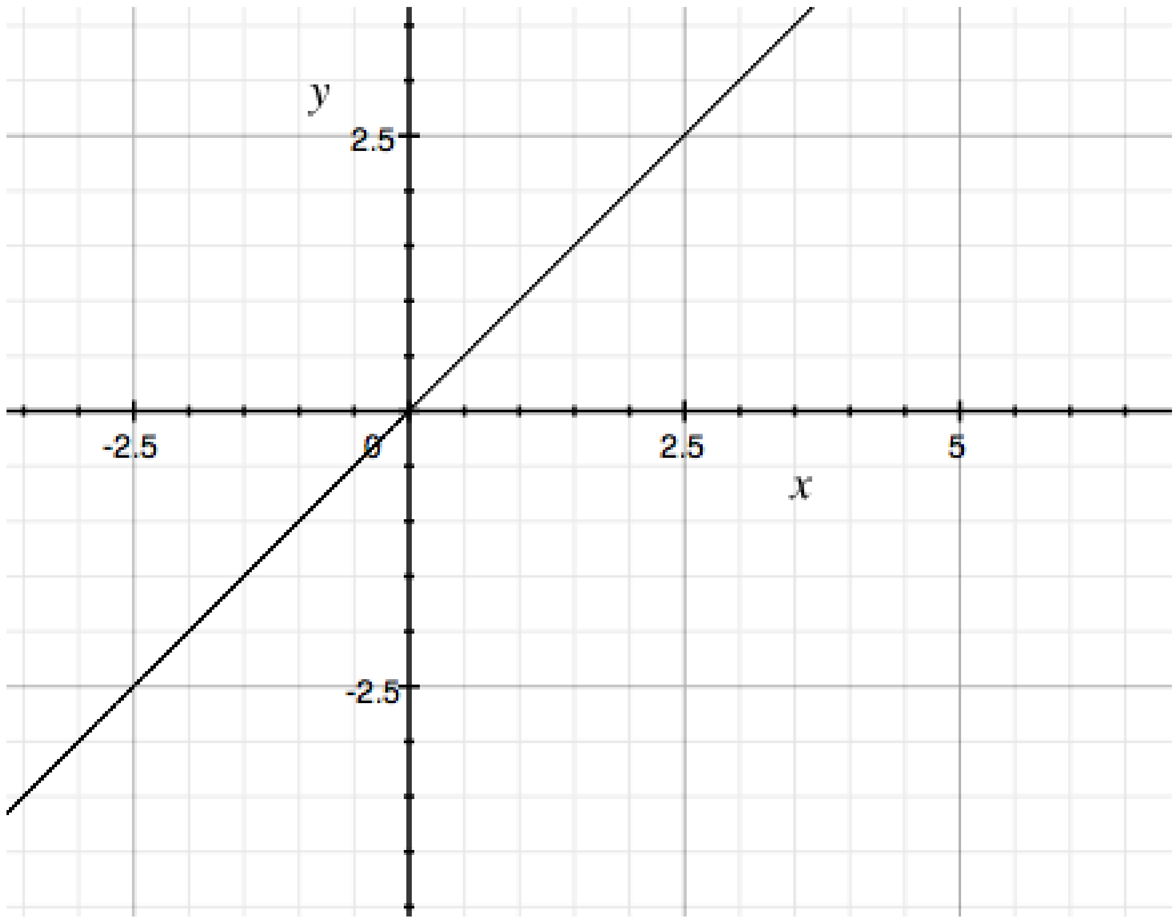
- Office hours.

- Study groups!

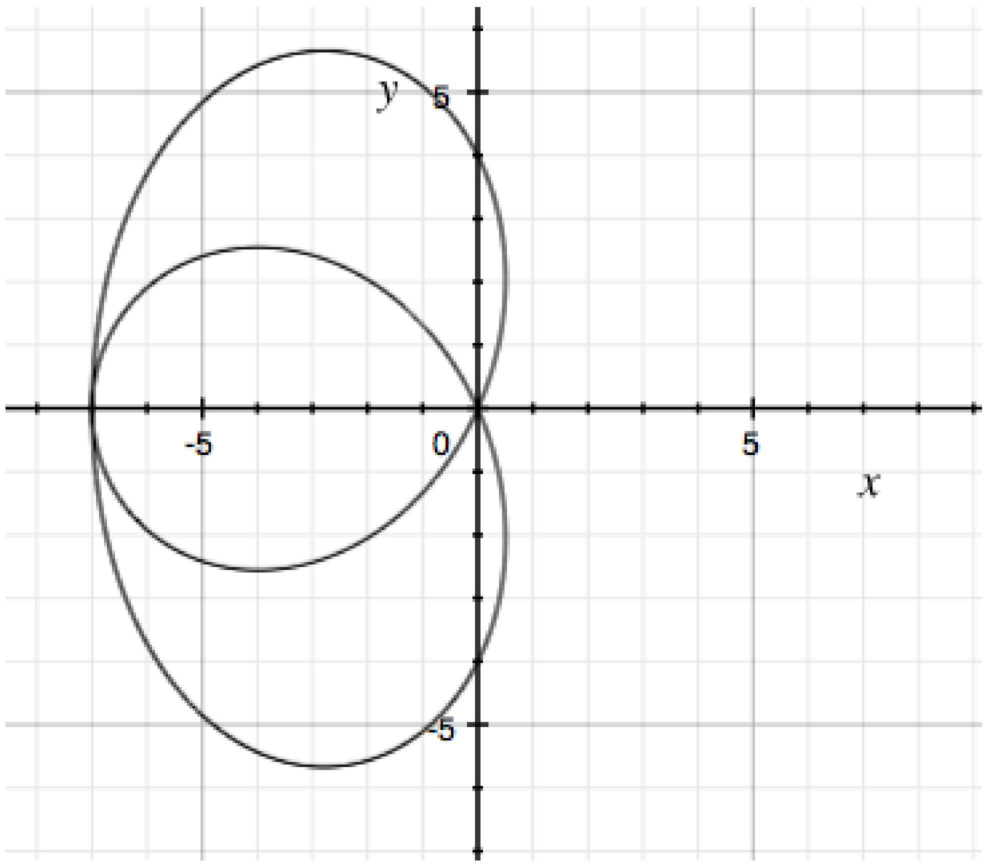
POP QUIZ!

Write your name at the top of a blank sheet of paper.

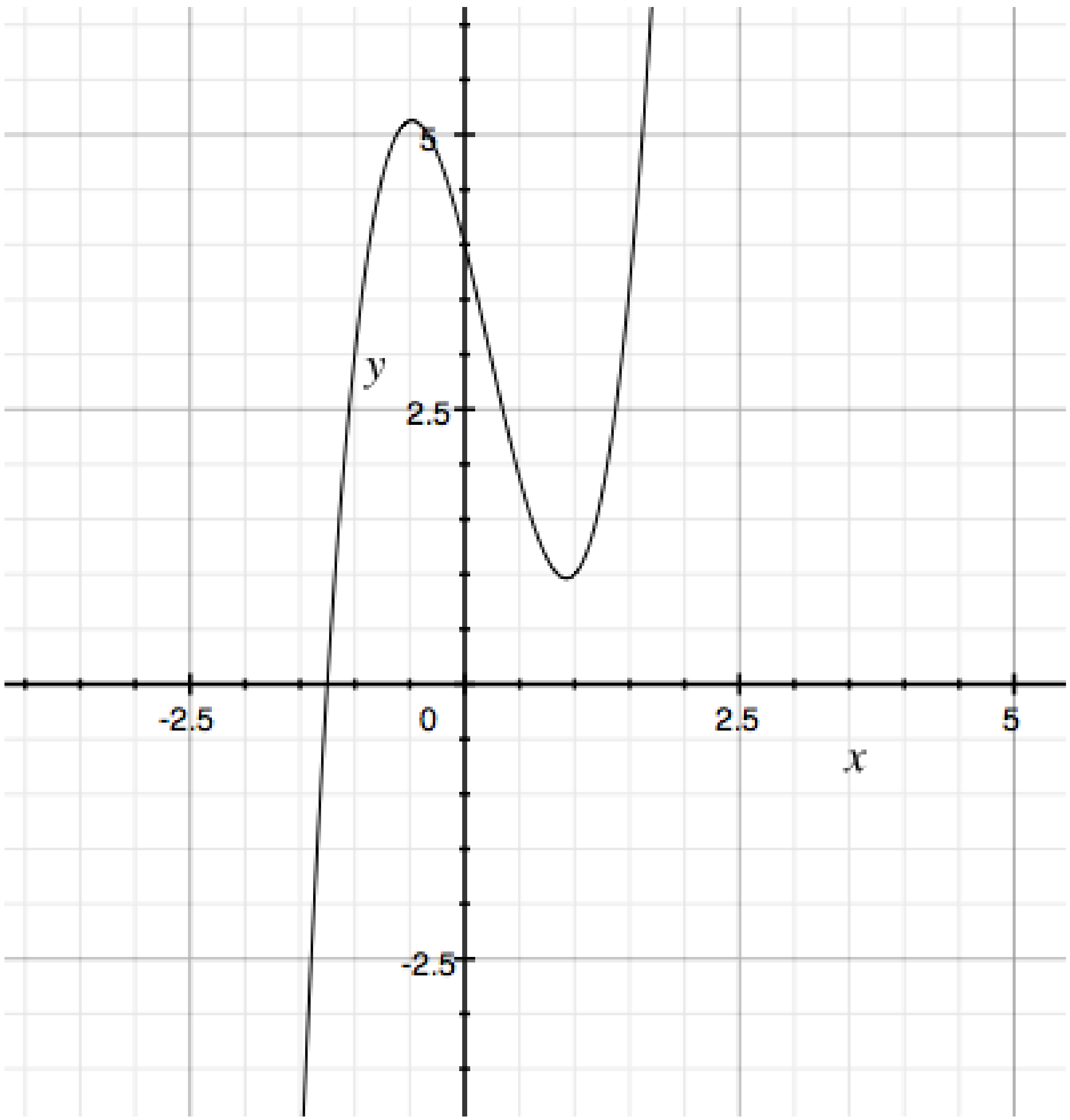
1) Which of these pictures might depict the graph of a function?

A) 

B)



C)



Consider the function

$$f(x) = 4x - 4.$$

1. What is the slope of f?

2. What is the y-intercept?

3. What is the x-intercept?

Now, swap your answer sheet with your neighbor.

(If you don't know their name, introduce yourself!)

Let's grade it!

Functional Models

What do we do with functions in the real world?

Functional Models

What do we do with functions in the real world?

- We use them for **modelling.**

So, there's some quantity that we want to understand. (Calculuate, predict, etc.)

We work out that this quantity depends on some variables, and we try to work out the relationship.

(In reality, we'll probably miss some variables, and only get an approximate relationship.)

Then we test out model, to see how good it is, and adjust it.

As stated earlier, we're not really going to do much in the way of working out relationships, or testing to see how good they are.

However, we **can** interpret results to see exactly what we've worked out.

We'll do a lot of this later.

For the moment, two important concepts are:

- **Market equilibrium** – the number of units where the demand function equals the supply function.

- **Break-even point** – The number of units where the Revenue function equals the cost function.

Limits

The limit of a function $f(x)$ as x approaches a value c is a value D if the closer x gets to c the closer $f(x)$ gets to D.

[NOTE: c may or may not be in the domain of f.]

We write:

$$\lim_{x \to c} f(x) = D.$$

"The limit of $f(x)$ as x approaches c is D."

For many ordinary functions, we have $f(c) = D$, and we can just 'plug' in c.

However, with the difference quotients, we can never just plug in $h = 0$...

Example: Let $f(x) = 3x$. We saw last time that

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

so long as $h \neq 0$.

So, if you look at value closer and closer to 0, the difference quotient is always 3. So, even though it's not defined at 0, we get

$$\lim_{h \to 0} \frac{3(x+h) - 3x}{h} = 3.$$

[NOTE: The value of x does not affect anything here.

Example: Suppose $f(x) = x^2 + 7$. We saw last time that the difference quotient (for h not 0) was $2x + h$.

As h gets closer to 0, this value gets closer to $2x$, so we get

$$\lim_{h \to 0} \frac{(x+h)^2 + 7 - (x^2 + 7)}{h} = 2x.$$

Many more examples of limits to follow...