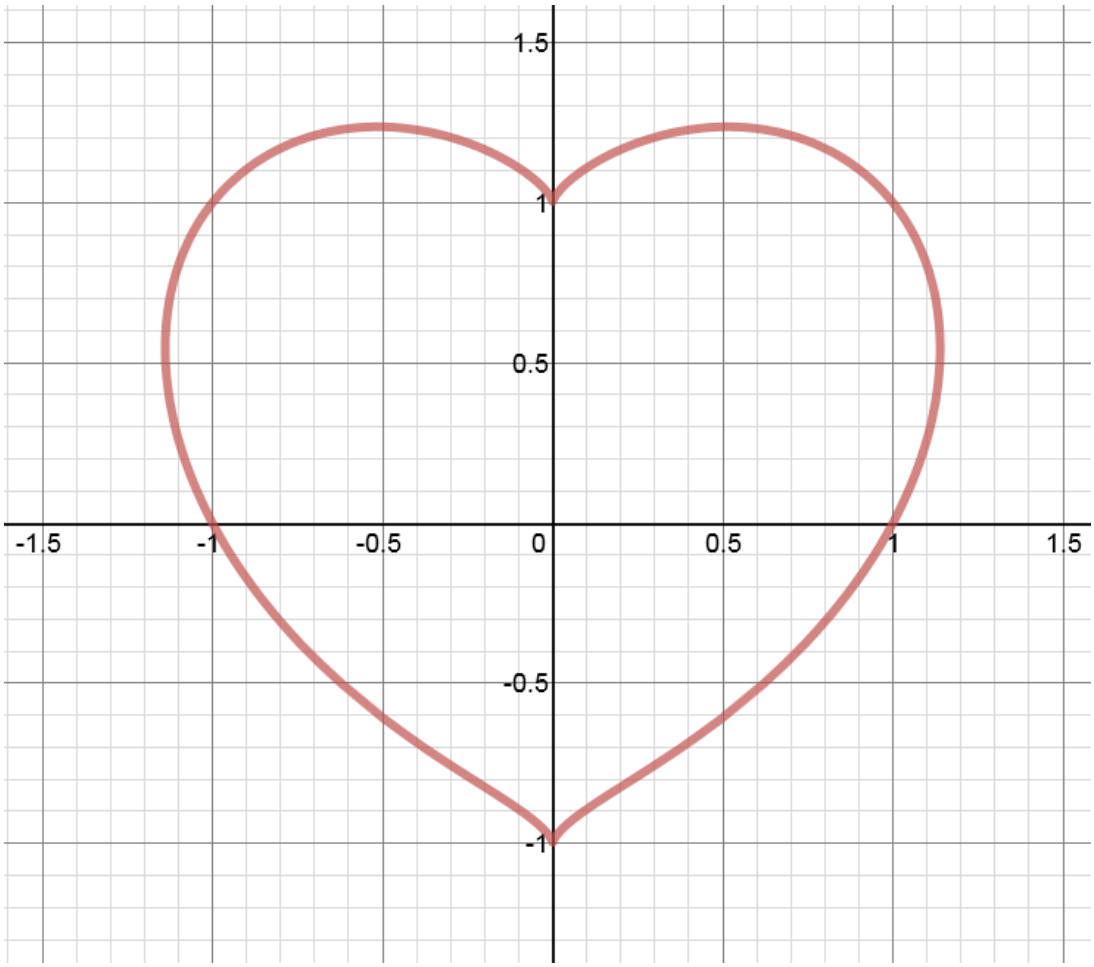
Mathematical Relationships



- We will be using Desmos.com/calculator throughout the semester.
- You will need to create an account to save your work.
- Do this now: **www.desmos.com/calculator**
- Can use a Google Account and copy work to Google Drive. (If you have a YouTube account then you have a Google account.)

Netbook Check Day!!

Today will be disorganized and crazy but I want to get a list of what netbooks are working:

- Login Problems
- Internet Issues
- Record any errors please!

1st: Take a netbook.

2nd: If it is already on - reboot immediately.

3rd: Check a few Internet sites.

4th: Check Desmos.com

Introduction Activity

Use the Desmos website to plot the following tables of data:

Hit the Gas

x	y
0	0
1	2.0
2	8.0
3	18
4	32
5	50

Cruise Control

x	y
0	2.0
1	5.0
2	8.0
3	11
4	14
5	17

Growth

x	y
0	1
1	2
2	4
3	8
4	16
5	32

With your best guess classify each of the above relationships as linear or non-linear.

Continue the pattern for each example for x = 6, 7, and 8.

Determine a formula for each pattern. The formula should calculate each value of ***y*** for the given value of ***x***. It will be written like ***y = 6x +2***, for example.

There exists a variety of mathematical relationships: Explore some!

Enter each equation into Desmos. Set all constants (the letters *a,b,c*, or *d*) to sliders and see what happens! Delete the equations before moving to the next one.

Lines: $y = ax + b$

Quadratics: $y = ax^2 + bx + c$

Exponential: $y = ab^x$

Shapes: $(x+a)^d+(y+b)^d=c^2$, set d = 0.8, 2, and 10 for special shapes!

Ellipse: $\frac{(x-a)^2}{b^2}+\frac{(y-c)^2}{d^2}=3$

Heart: $(x^2 + y^2 - a)^3 - x^2y^3 = 0$, $a > 0$

Fermat Spiral: $r = a\theta^b$, θ - type the word "theta".

Logarithmic Spiral: $r = 0.4e^{0.1\theta}$

Flowers: $r = a\sin(b\theta)$

Hole: $r = 5\tan(b\theta) + \cot(b\theta)$

Crazy!: $r = a\cos(b\theta)+\tan(b\theta)$, I like the one with b = 4.

4.1 Writing Equations to Describe Patterns

Connect

A landscape designer uses wooden boards as edging for the plots in a herb garden.

1 plot 2 plots 3 plots 4 plots

The number of boards, b, is *related* to the number of plots, p.

➤ Determine a pattern in the number of boards.

Number of Plots, p	Number of Boards, b
1	4
2	7
3	10
4	13

(+1, +1, +1 between the plot values; +3, +3, +3 between the board values)

As the number of plots increases by 1, the number of boards increases by 3. Repeated addition of 3 is the same as multiplication by 3. This suggests that the number of boards may be 3 times the number of plots. So, the equation $b = 3p$ may represent this relationship.

This is 1 less than the number 4 in the table. So, we add 1 to $3p$ to describe the number of boards correctly.

The terms $3p + 1$ form an *expression* that represents the number of boards for any number of plots p. An equation is: $b = 3p + 1$

Number of Plots, p	Number of Boards, b
1	$3(1) + 1 = 4$
2	$3(2) + 1 = 7$
3	$3(3) + 1 = 10$
4	$3(4) + 1 = 13$