NCTM Annual Meeting and Exposition 2017

April 5 – 8, 2017

San Antonio, Texas

Session 474
Using the Desmos Calculator to Analyze Student Photographs and Pictures

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http://www.corestandards.org/Math/Practice/

MP1 Make sense of problems and persevere in solving them:

*how you could express the problem with equations, diagrams, or graphs.

MP4 Model with mathematics:

*express data and relationships in the problem with tables, graphs, diagrams, or equations, and check your result to see if it makes sense.

MP5 Use appropriate tools strategically:

*decide which tools are most helpful for solving the problem and why.

MP6 Attend to precision:

*think carefully about the required accuracy of results; is a number estimate or geometric sketch good enough, or is a precise value or drawing needed?

Skills Available for Common Core

Sixth-Grade Math Standards

https://www.ixl.com/standards/common-core/math

6.RP Ratios and Proportional Relationships

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

6.RP.A.3a Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.

6.NS The Number System

6.NS.C.6b Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.

6.NS.C.6c Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

6.EE Expressions and Equations

6.EE.C Represent and analyze quantitative relationships between dependent and independent variables.

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6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

Seventh-Grade Math Standards

7.RP Ratios and Proportional Relationships

7.RP.A.2 Recognize and represent proportional relationships between quantities.

7.RP.A.2a Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

7.RP.A.2b Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

7.RP.A.2c Represent proportional relationships by equations.

7.RP.A.2d Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.

Eighth-Grade Math Standards

8.EE Expressions and Equations

8.EE.B Understand the connections between proportional relationships, lines, and linear equations.

8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

8.EE.B.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.

8.F Functions

8.F.A Define, evaluate, and compare functions.

8.F.A.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

8.F.A.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

8.F.A.3 Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

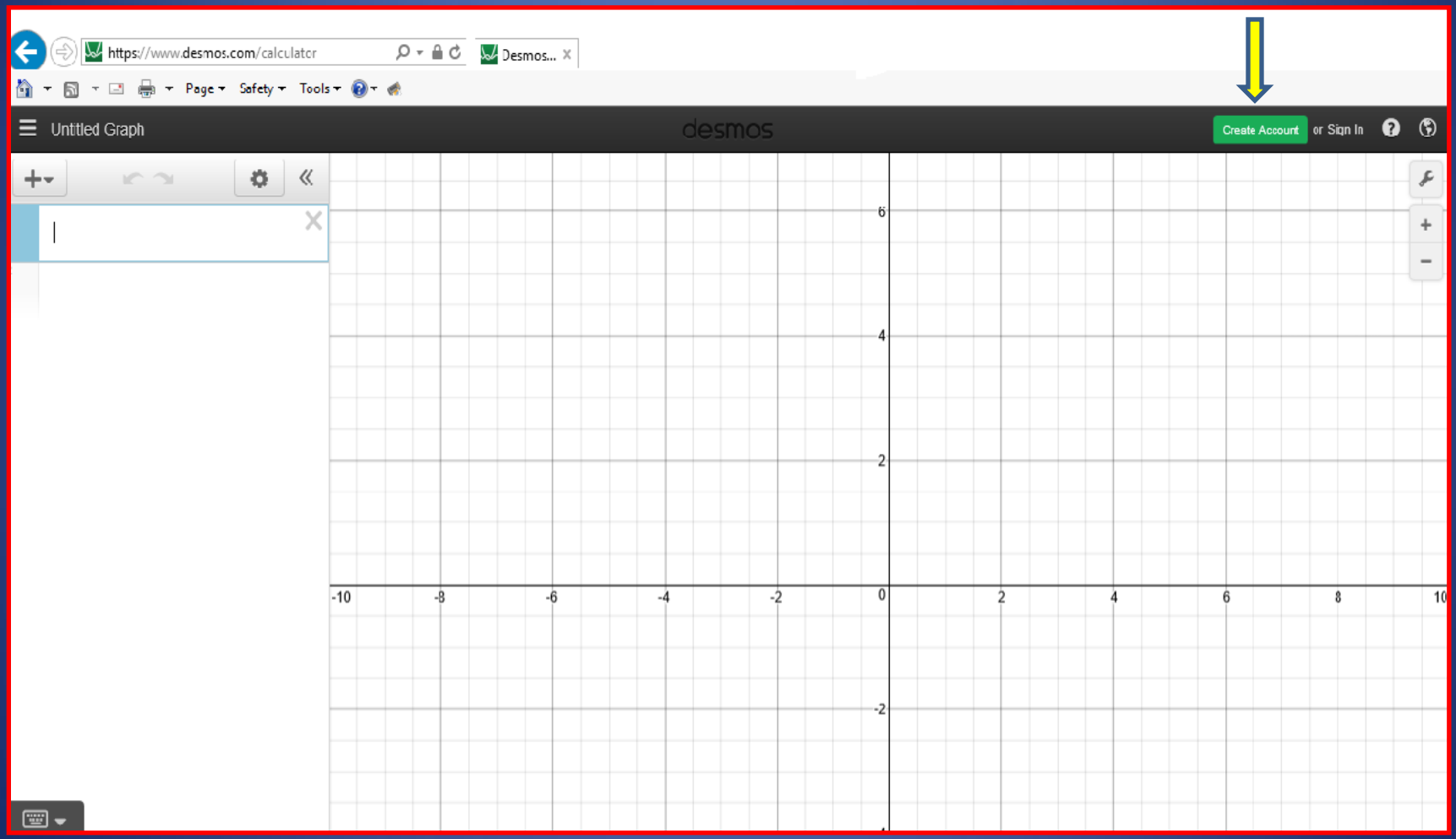
8.F.B Use functions to model relationships between quantities.

8.F.B.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

8.F.B.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

https://www.desmos.com/calculator

Be sure to create an account as soon as you access the calculator!



http://support.desmos.com/hc/en-us/articles/209686513-Changing-the-Viewing-Window

desmos

Desmos > Calculator Settings > Graph Settings Menu

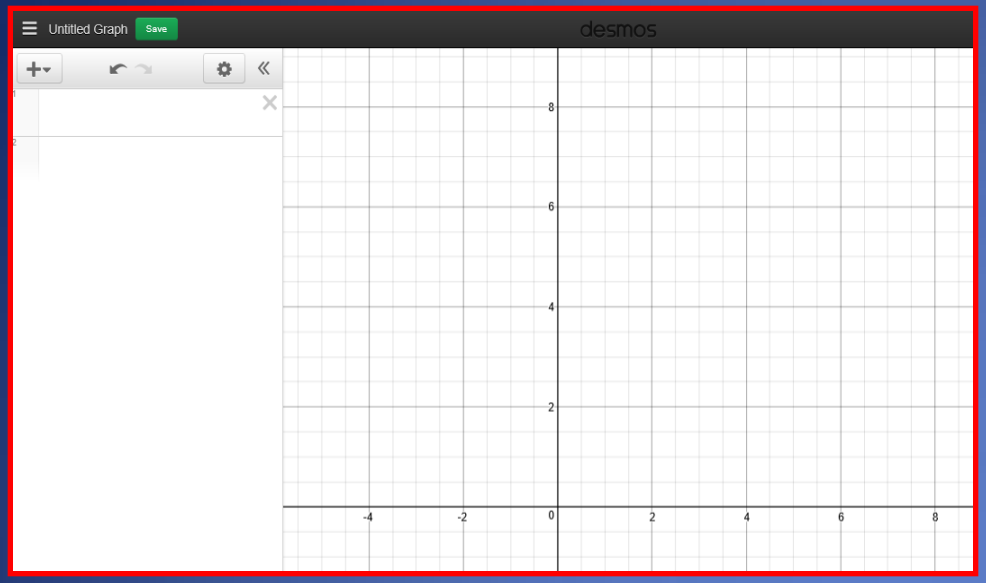
Search

Changing the Viewing Window

Team Desmos
February 01, 2017 17:15

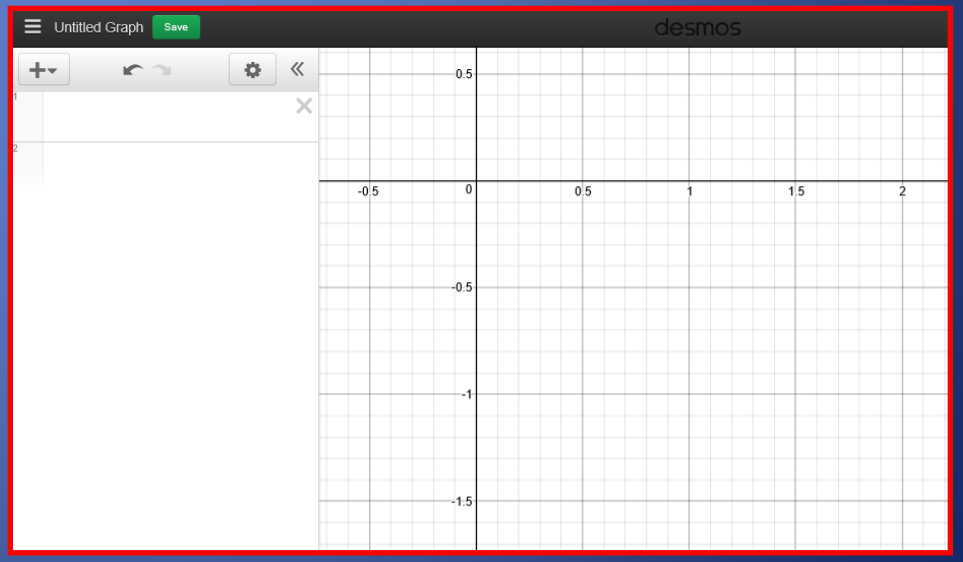
Follow

You can change the viewing window to better fit the data you're looking at. For making easy adjustments while accessing Desmos in the browser, you can use the plus and minus signs to zoom in and out, respectively, on the coordinate plane. You can also use the house icon to go back to the default viewing window which is pre-defined depending on the screen size.

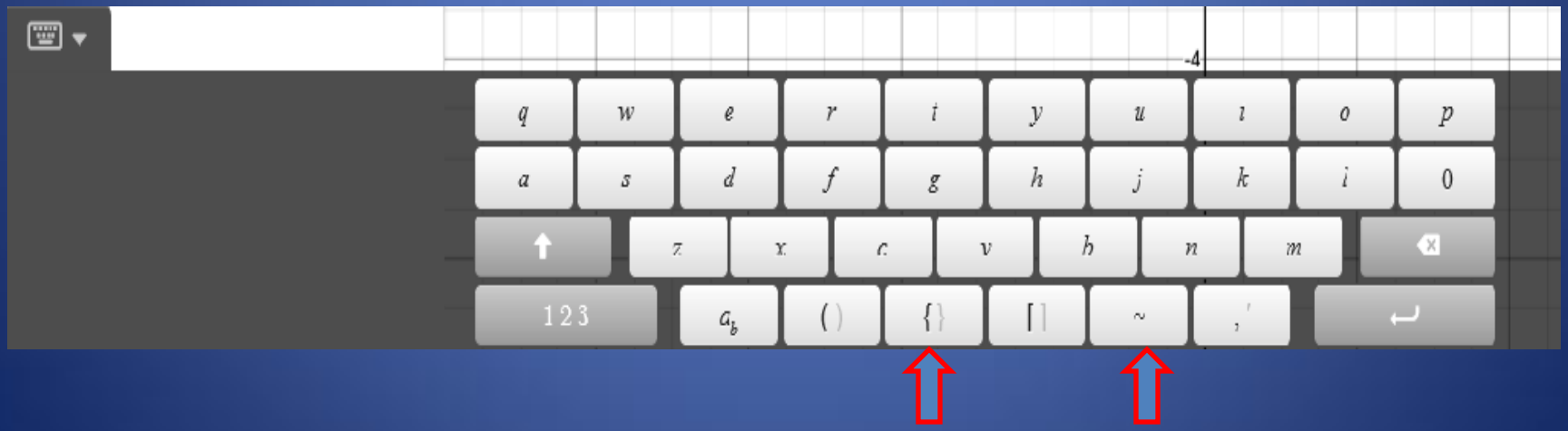


You can drag the coordinate axes to other locations.

You can also change the increments on the axes by zooming in or out.



Press the "ABC" key and another keyboard will pop up. This one has the braces (restricted domains/ranges) and the symbol for "is approximately" (line of best fit.) Students will need both of these for writing equations.



Name _____ **Date** _____ **Period** _____

Partner's name: _____

Partner's name: _____

Working With The Desmos Graphing Calculator – Activity 1

https://www.desmos.com/calculator

Today, you and your partner (s) will be working on linear graphs with the on-line Desmos Graphing Calculator. Mrs. Cooperman will demonstrate how to put in the linear equations in the form $y = mx$, $y = mx + b$, and $y = b$. You will need to write down the equations you experimented with and compare and contrast the results of the graphs that are formed.

(You do not have to create an Account at this time.)

Part 1: $y = mx$

(1) In the rectangular box on the left, type in $\mathbf{y = x}$; you should see a graph that is a straight line passing through (0, 0).
   (a) What is the constant multiplier (the coefficient of x) for this equation?
   (b) We also refer to that number as the "slope". What is the change in the y values as x increases by 1 unit?

(2) In the second rectangular box, type in $\mathbf{y = 2x}$; another graph should appear. Describe the characteristics of that graph and then compare it to the first one.

_____

_____

_____

_____

(3) For your third equation, type in $\mathbf{y = \frac{1}{2} x}$; (you'll have to "click" out of the denominator!) Describe the characteristics of that graph and compare it to the others.

_____

_____

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_____

(4) For your fourth equation, type in **y = -x**; what has happened? Describe the characteristics:

_____

_____

_____

_____

(5) Now type in **y = -3x**; what are the characteristics of this graph?

_____

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(6) The last equation is **y = -1/2x** (don't forget to "click out" of the denominator); describe the characteristics of this graph:

_____

_____

_____

_____

<u>Part 2</u>: y = mx + b (Be sure to delete the previous graphs in Part 1 first!)

(1) Graph **y = 2x + 3**; describe the graph:

_____

_____

_____

_____

(2) Graph **y = 2x – 1**; describe this graph and compare it to the one in ex. (1).

_____

_____

_____

_____

What did you notice about the lines that have the same slope? _____

_____

What were the y intercepts?_____

(3) Graph **y = -2x + 3**; describe the graph and compare it to ex. (1).

_____

_____

_____

_____

(4) With your partner(s), write two more equations in the form y = mx + b and describe their graphs (compare/contrast!)

_____

_____

_____

_____

Part 3: y = b (Delete all the equations from Part 2)

(1) Graph **y = 5, y = 2.5, y = -6, and y = -1/2**; describe the characteristics of these graphs:

_____

_____

_____

_____

(2) Write two more equations, one with a negative number and one with a positive number. List them and compare them:

Equation 1:_____ Equation 2:_____

_____

_____

_____

Part 4: Optional Graphs: you may graph the following equations and observe what the graphs look like. Describe their characteristics on the lines below. (Delete all the equations from Part 3)

(1) $y = x^2$

(2) $y = x^2 + 2$

(3) $y = x^2 - 5$

(4) $y = -x^2$

(5) $y = -x^2 + 2$

(6) $y = -x^2 - 5$

(7) $y = 2x^2$

(8) $Y = -2x^2$

_____

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Working With The Desmos Graphing Calculator – Activity 2

https://www.desmos.com/calculator

Today, you will be working with "sliders". These allow you to change the parameters of an equation so you can see the animations as the values increase and decrease.

(You should create an Account at this time if you haven't already done so. When you make interesting and creative graphs, be sure to SAVE them with a title. Then you can do a screenshot and send it to Mrs. Cooperman via email!)

(1)In the rectangular box on the left, type in **y = mx**; you should see a graph that is a straight line passing through (0, 0).

(2)A "slider" graphic will suddenly appear and you will be asked if you would like to add one for "m". **(Yes!)** The "slider" is the constant multiplier (the coefficient of x) and is represented by the "m".

(3) You can move the slider back and forth, changing the multiplier from negative to positive values. Each time you move the slider, the graph changes on the coordinate plane.

(4)Describe what happens with the graphs; be very specific about the positive, zero, and negative multipliers!

_____

_____

_____

_____

_____

_____

_____

(5)Type in this equation, type in **y = 5**; another slider graphic will appear. What kind of lines are you working with now? _____

Describe the characteristics of these graphs such as the y intercept, as you move the slider back and forth:

(6) For your next equation, type in **y = 2x + b**; what has happened? Now describe the characteristics of these graphs:

What do you think will happen if you change the **2** to **-2**? (You will have to eliminate y = 2x +b first otherwise the slider won't appear.)

(7) The next equation is **y = mx + 4**; describe the characteristics of this graph:

Suppose you changed the equation to **y = mx – 2**; (be sure to eliminate all the other equations first otherwise the slider won't appear!)

What happens?

http://support.desmos.com/hc/en-us/articles/202528949-Domain-and-Range-Restrictions

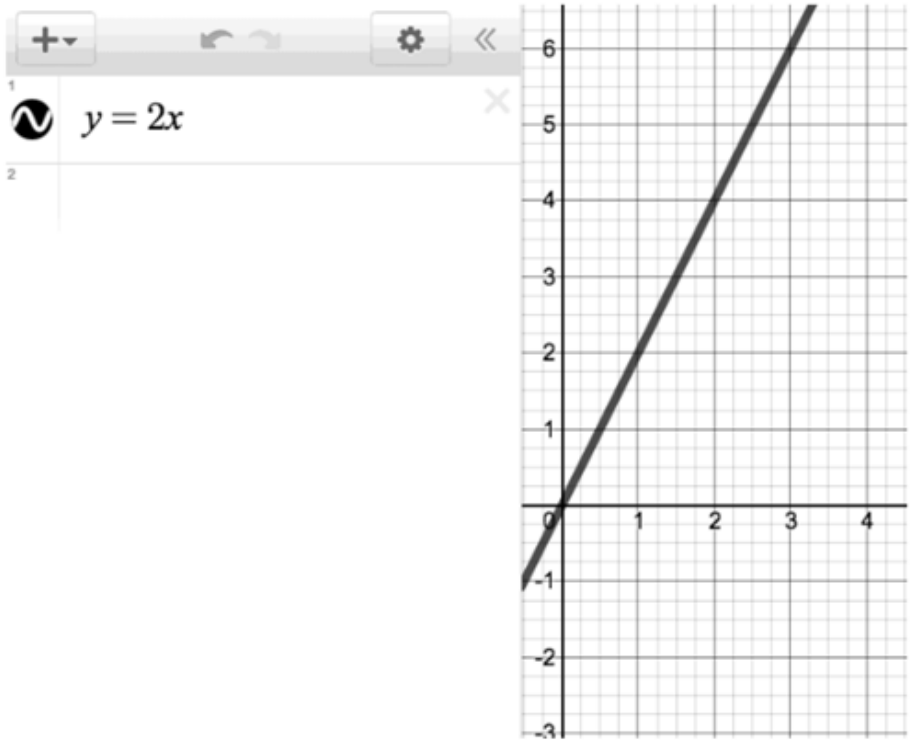
Domain and Range Restrictions

Team Desmos
January 23, 2017 14:16

Follow

Overview

To limit the domain or range (x or y values of a graph), you can add the restriction to the end of your equation in curly brackets {}. For example, y=2x{1<x<3} would graph the line y=2x for x values between 1 and 3.



Remember when we were looking at the second keyboard on the Desmos graph? Students will need the braces in order to restrict the domains and ranges of the lines outlining the objects in their photos.

Domain and Range Restrictions

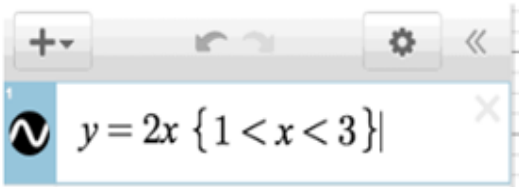
Team Desmos

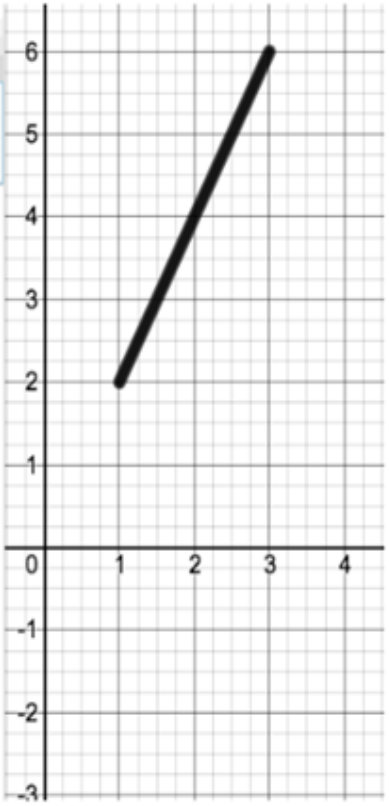
January 23, 2017 14:16

Follow

Overview

To limit the domain or range (x or y values of a graph), you can add the restriction to the end of your equation in curly brackets {}. For example, y=2x{1<x<3} would graph the line y=2x for x values between 1 and 3.

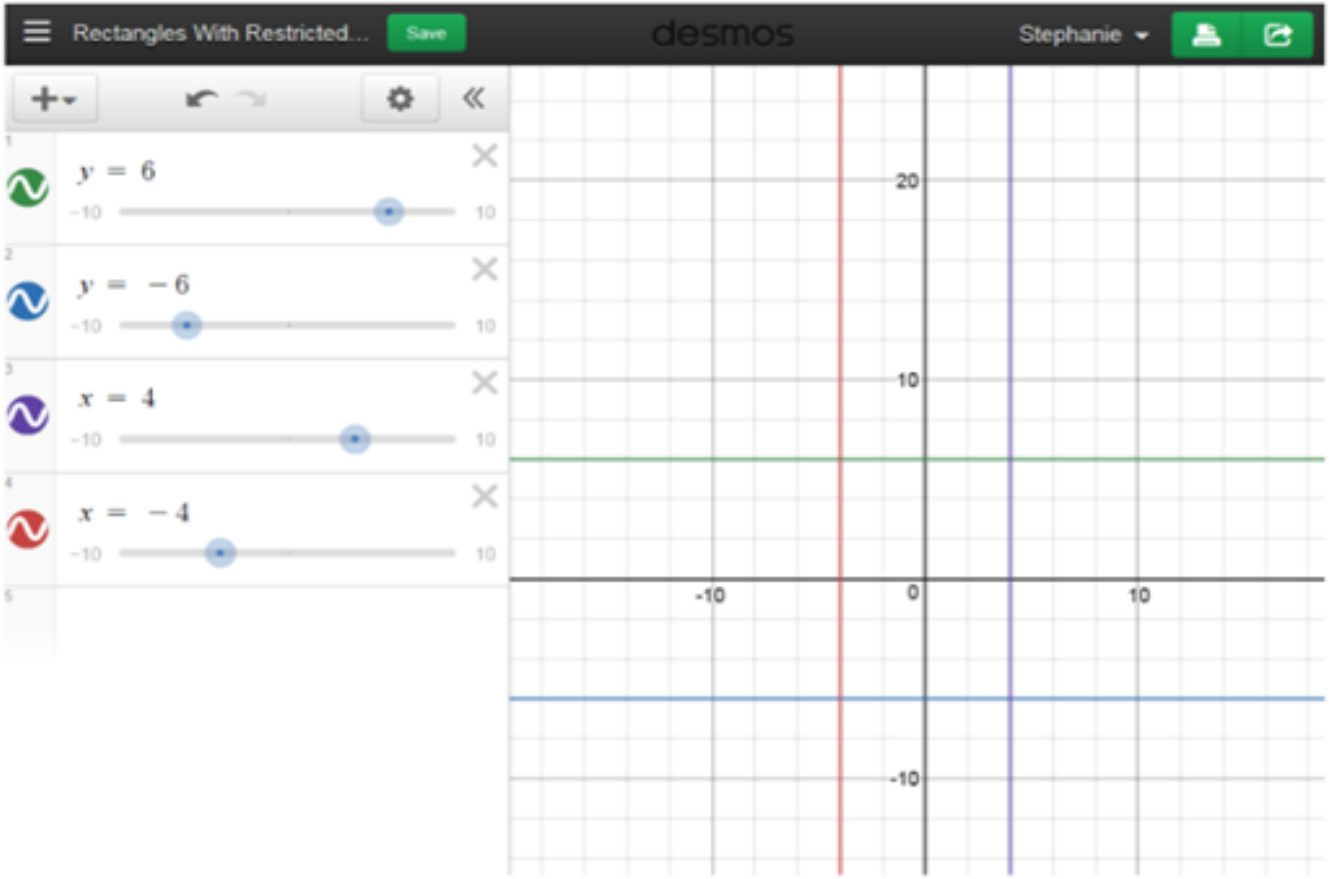




Students will need to adjust their lines so that segments outline the various shapes in their photographs. This can be done by restricting the domain and range of the equation.

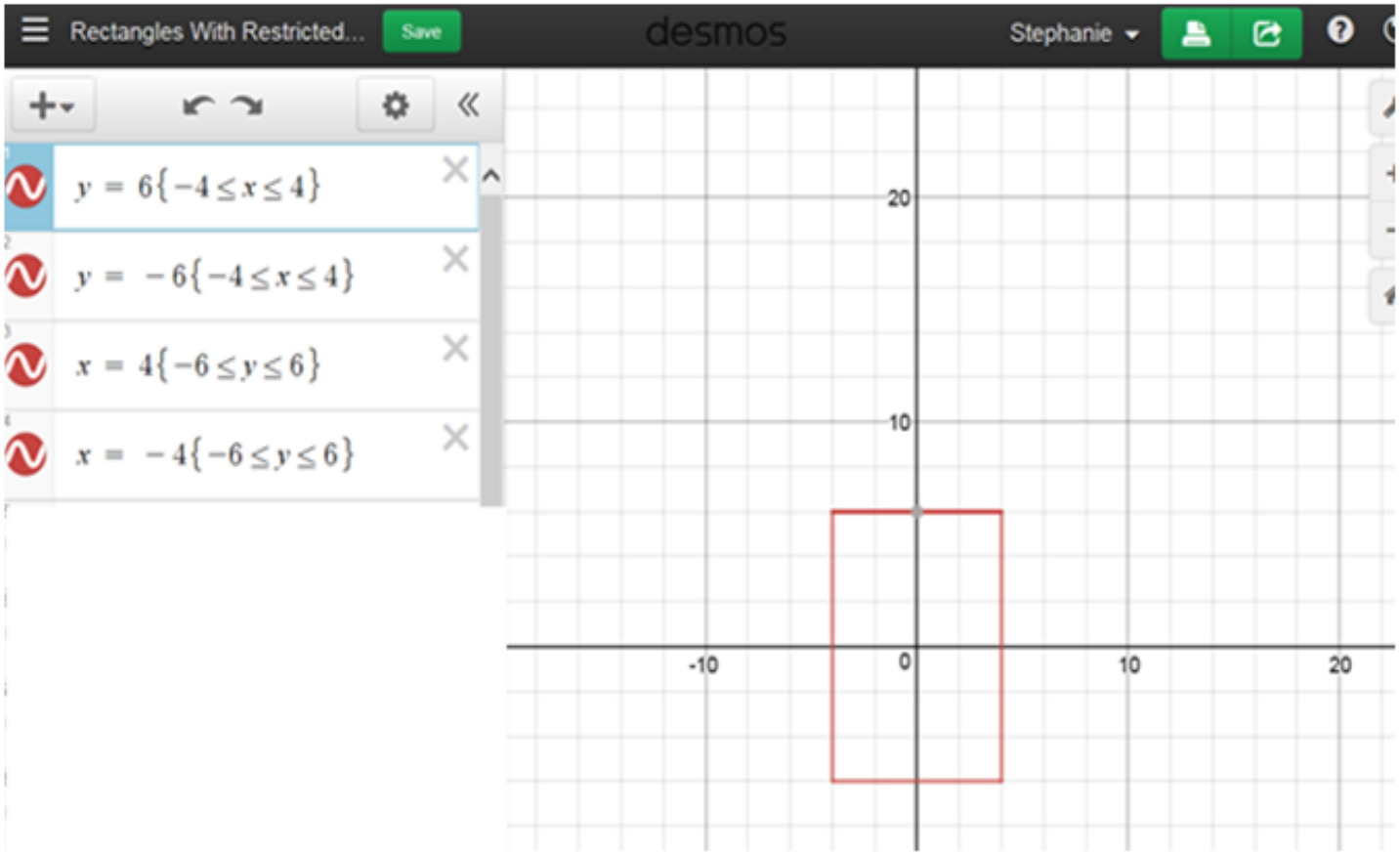
Desmos Graphing Calculator Activity 3

Making a Rectangle Using Restricted Domains

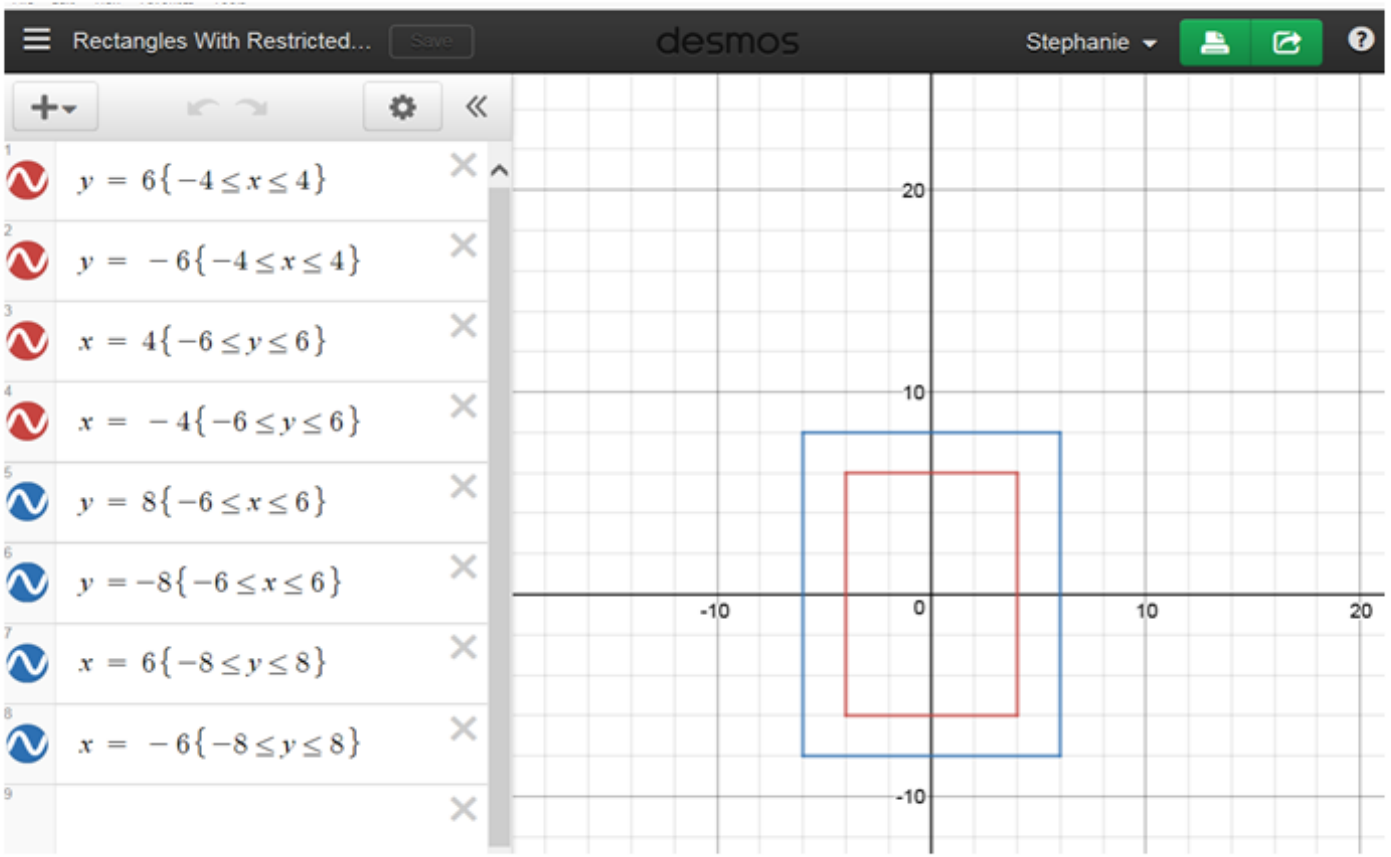


You can use **"restricted" domains** with the Desmos Graphing Calculator to make geometric shapes from linear graphs. We will also be using vertical and horizontal lines to make the sides.

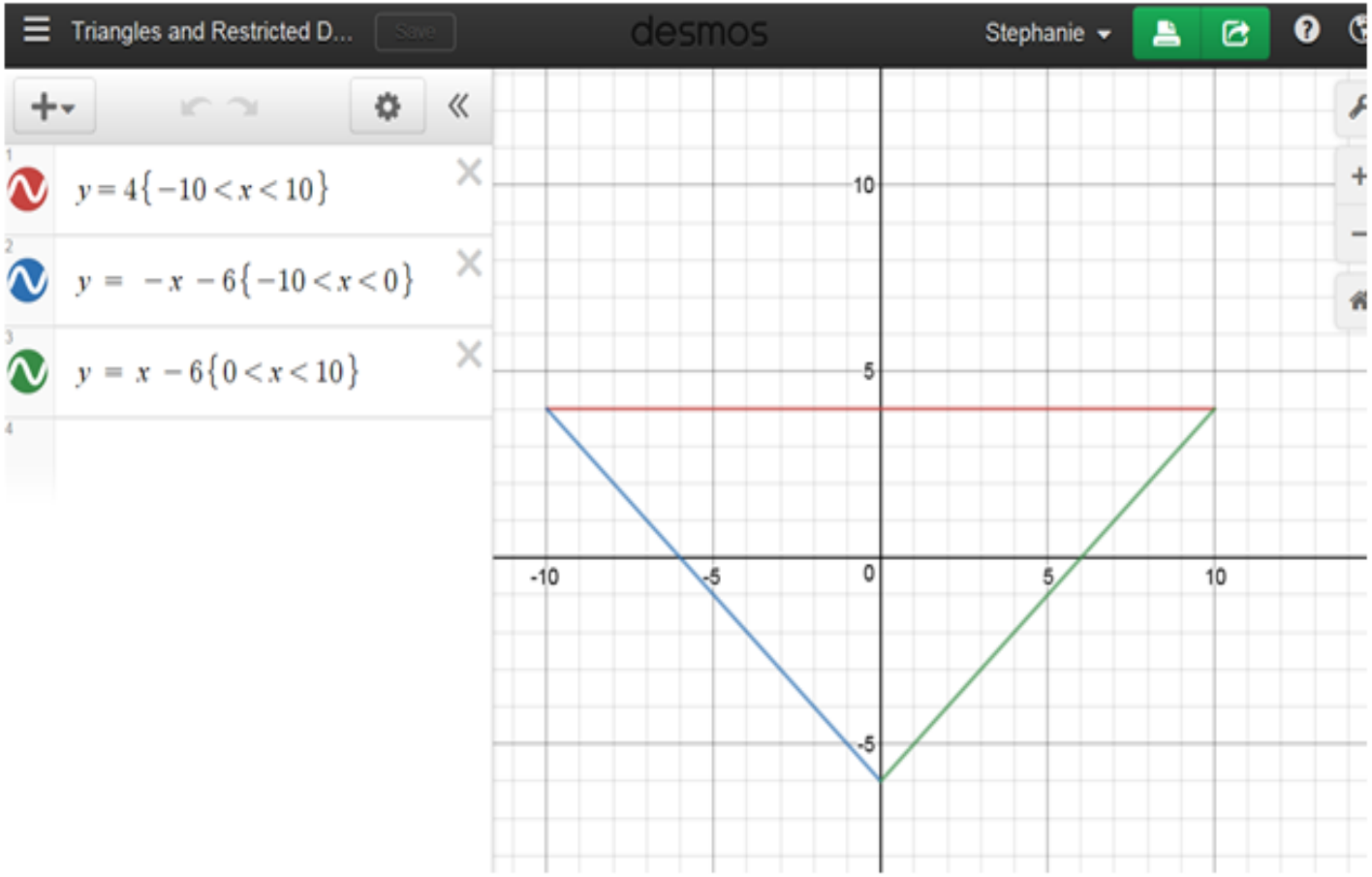
We're going to add the braces with the restrictions for x and y ***next*** to the original equations: **Be sure to include the braces <u>before</u> and <u>after</u> the values for x and y**. (You can make all the sides red.)



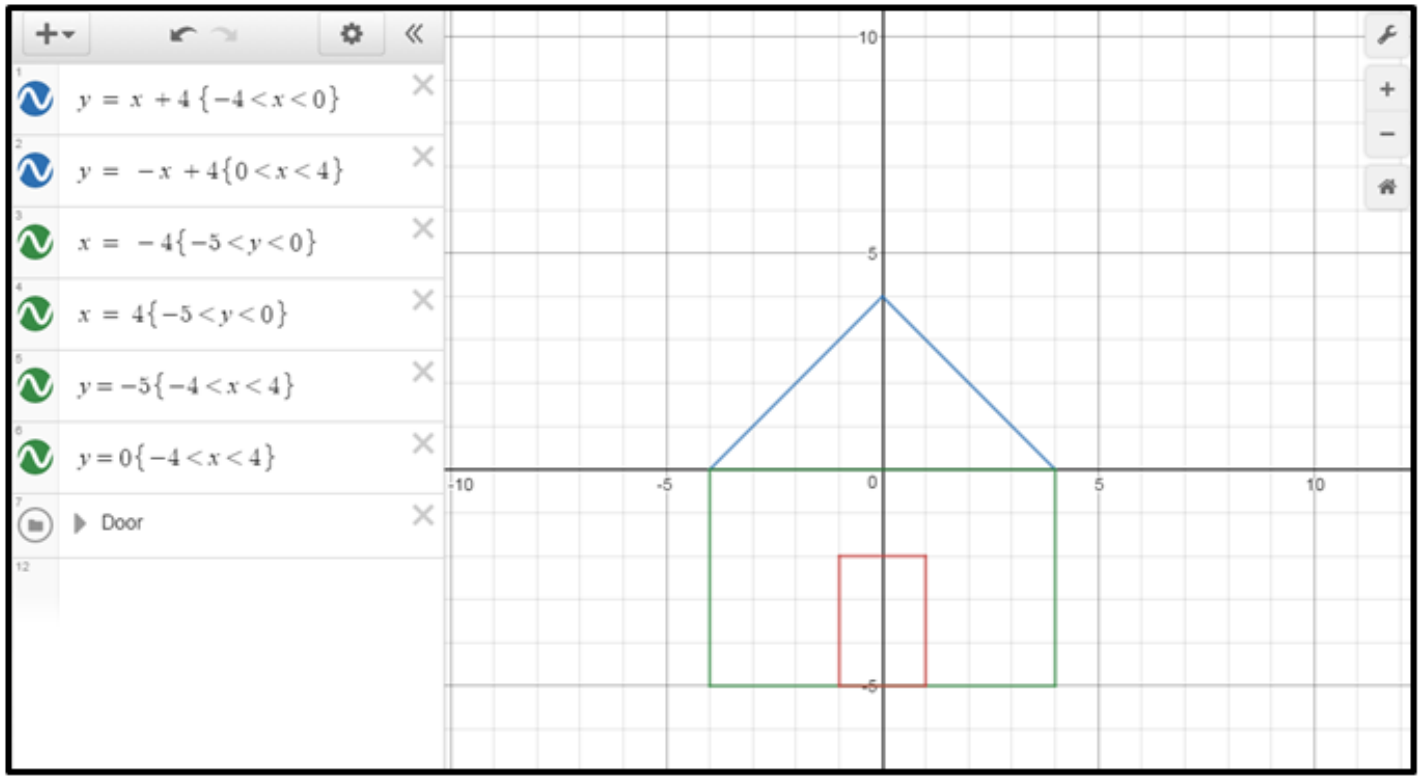
Let's put another rectangle around the first one. Look at the four new equations that determine the blue rectangle. (Each side of the larger rectangle was originally in four different colors. Change all of those sides to the color blue.)



Extra Practice: Making a triangle with restricted domains on x.



Using the Desmos Graphing Calculator to Make a House



When I open the folder called "Door"; all the equations that form the door are listed inside that folder! Using folders helps to save space on the equation column.

http://support.desmos.com/hc/en-us/articles/208156426-Adding-to-the-Graph-Add-Item-Menu-

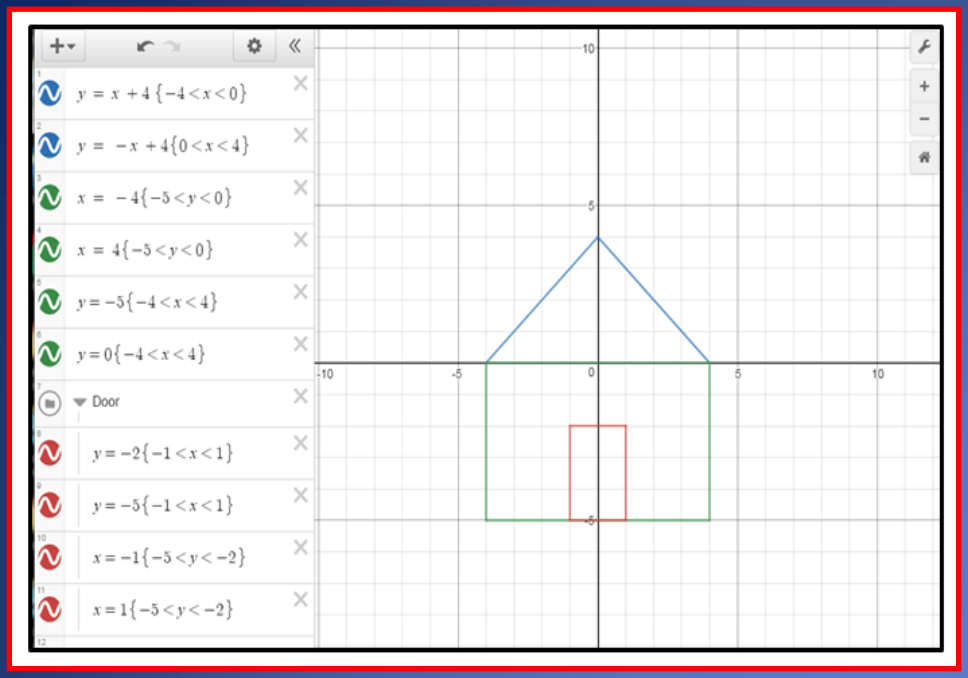
Adding to the Graph (Add Item Menu)

Team Desmos
June 06, 2016 19:26

Follow

You can use the **Add Item** menu to add an expression, note, table, folder, or image to your graph. To start, click on the "plus sign" and then choose the type of item you'd like to add to your graph. An example of each is below:

The "+" icon at the upper left of your graph allows you to add a note, an expression, a table, a folder, or an image. (We're getting closer and closer to the Photography Project!)


$y = x + 4\{-4 < x < 0\}$
$y = -x + 4\{0 < x < 4\}$
$x = -4\{-5 < y < 0\}$
$x = 4\{-5 < y < 0\}$
$y = -5\{-4 < x < 4\}$
$y = 0\{-4 < x < 4\}$
Door
$y = -2\{-1 < x < 1\}$
$y = -5\{-1 < x < 1\}$
$x = -1\{-5 < y < -2\}$
$x = 1\{-5 < y < -2\}$
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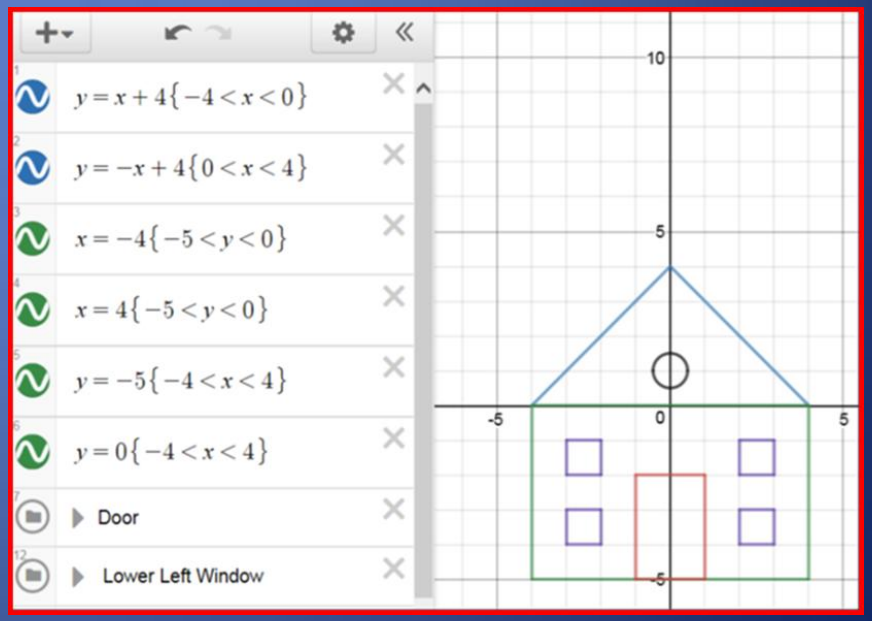
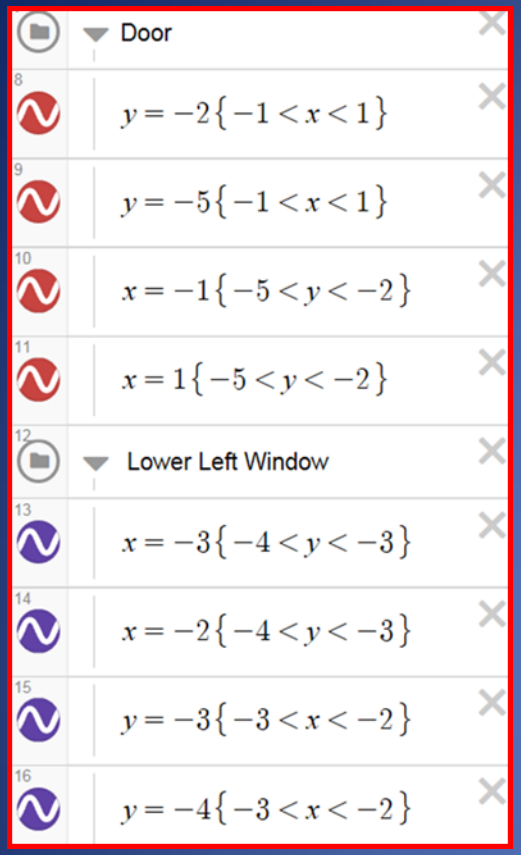
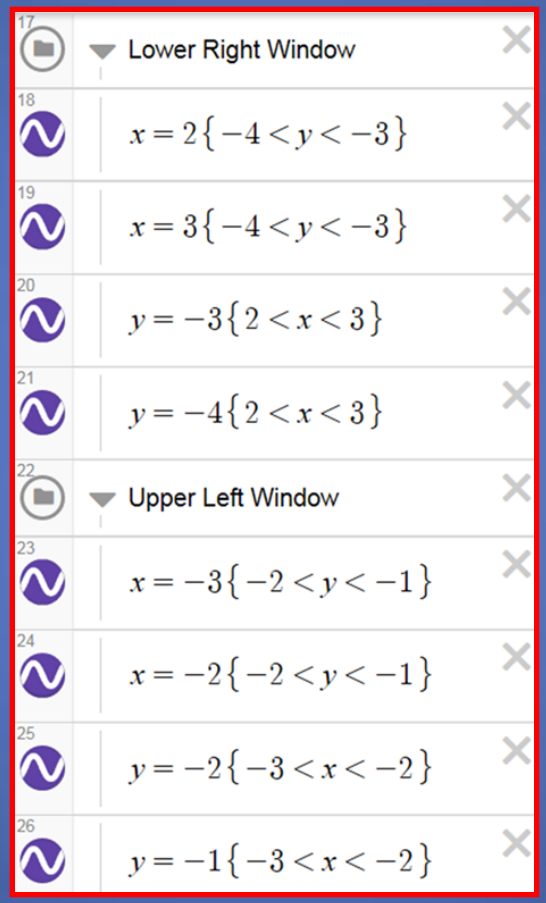
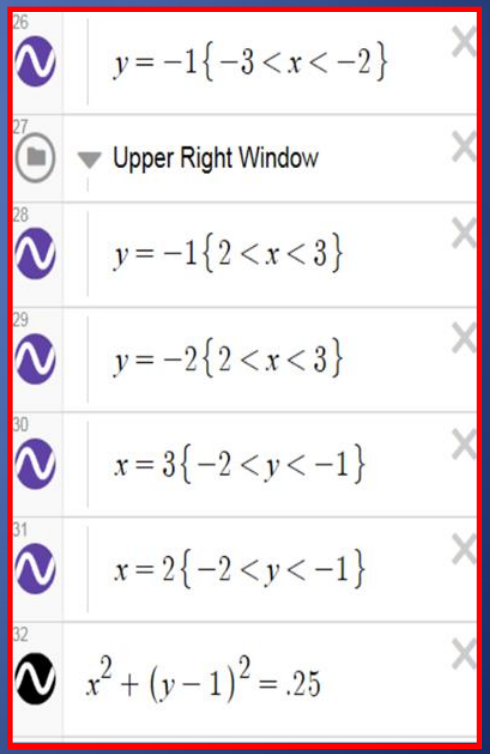
10


$y = x + 4\{-4 < x < 0\}$
$y = -x + 4\{0 < x < 4\}$
$x = -4\{-5 < y < 0\}$
$x = 4\{-5 < y < 0\}$
$y = -5\{-4 < x < 4\}$
$y = 0\{-4 < x < 4\}$
Door
Lower Left Window
10
5
-5
0
5
-5


Door
8 $y=-2\{-1<x<1\}$
9 $y=-5\{-1<x<1\}$
10 $x=-1\{-5<y<-2\}$
11 $x=1\{-5<y<-2\}$
12 Lower Left Window
13 $x=-3\{-4<y<-3\}$
14 $x=-2\{-4<y<-3\}$
15 $y=-3\{-3<x<-2\}$
16 $y=-4\{-3<x<-2\}$


17 Lower Right Window
18 $x=2\{-4<y<-3\}$
19 $x=3\{-4<y<-3\}$
20 $y=-3\{2<x<3\}$
21 $y=-4\{2<x<3\}$
22 Upper Left Window
23 $x=-3\{-2<y<-1\}$
24 $x=-2\{-2<y<-1\}$
25 $y=-2\{-3<x<-2\}$
26 $y=-1\{-3<x<-2\}$


26 $y=-1\{-3<x<-2\}$
27 Upper Right Window
28 $y=-1\{2<x<3\}$
29 $y=-2\{2<x<3\}$
30 $x=3\{-2<y<-1\}$
31 $x=2\{-2<y<-1\}$
32 $x^2+(y-1)^2=.25$

Note: Use the + key to add a folder which you'll need to title. After you write your equations, you can click on the white area around the colored icons of each equation and drag them on top of the folder. If it went into the folder properly, you'll see a light gray line on the left of the equation. Click on the folder to close it and all your equations will disappear from the column. Click on the folder to open it and all your equations will be listed again underneath!

You can make a folder for each window: two above the door and two more next to the door on each side.

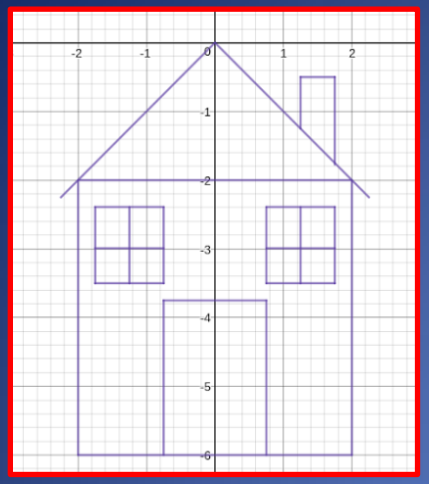
How about a chimney? Is the fireplace going?

A nice green lawn? Or is it snow-covered?

How about a picket fence?

Saving Screen Shots On Your Chrome Book

1. Press Ctrl + Switch Window; the screenshot will be taken.
2. When the popup says “screenshot taken”, click on it;
3. Then, drag to “My Drive” on the left.
4. Go to Google Drive:
5. Click “Make a Folder”; name it “Desmos”.
6. Go to “Recent” and then click on the screenshot(s).
7. Click the three dots and click “Move to”:
8. Move it to the folder, “Desmos”.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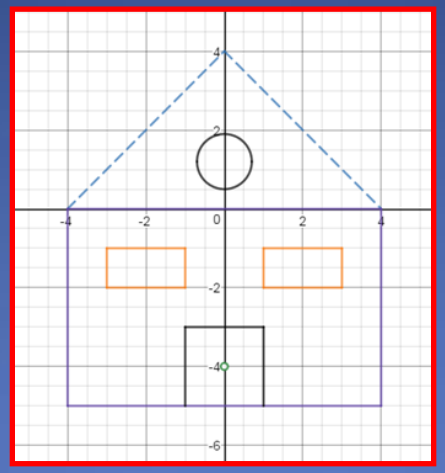
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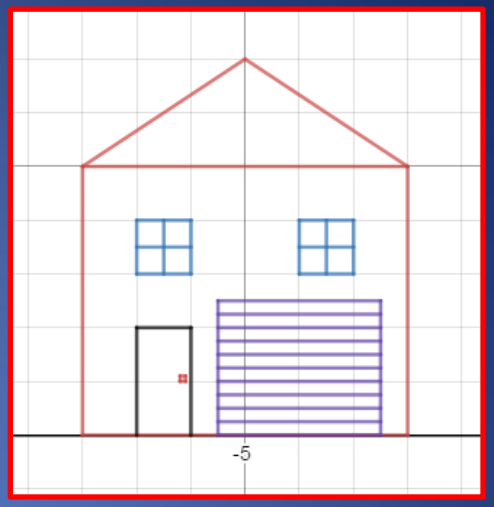
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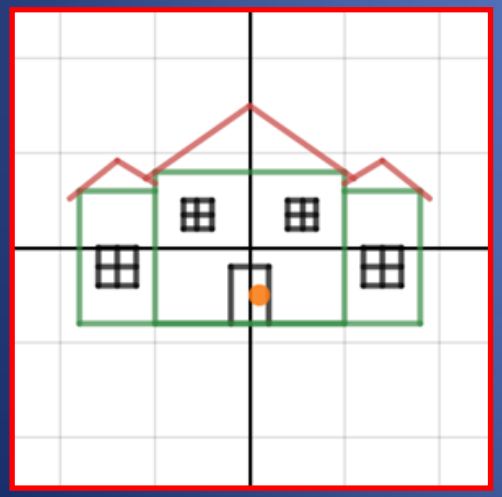

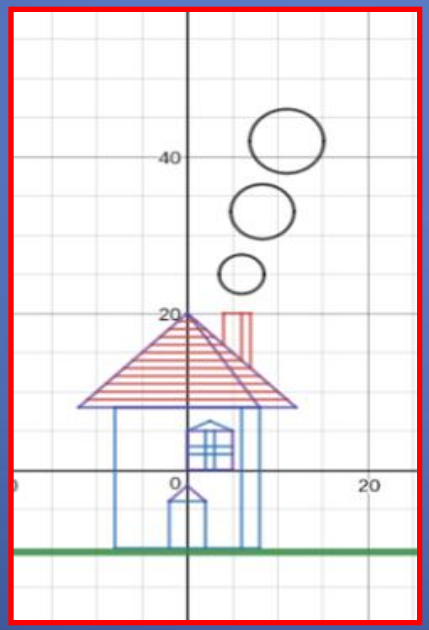
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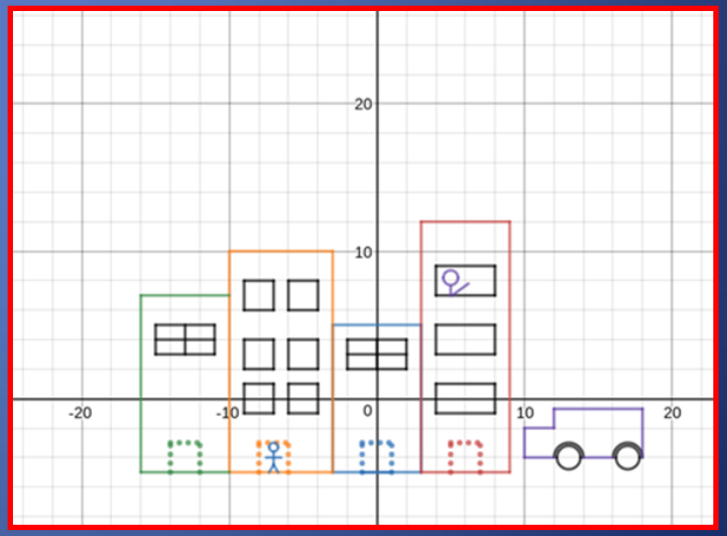
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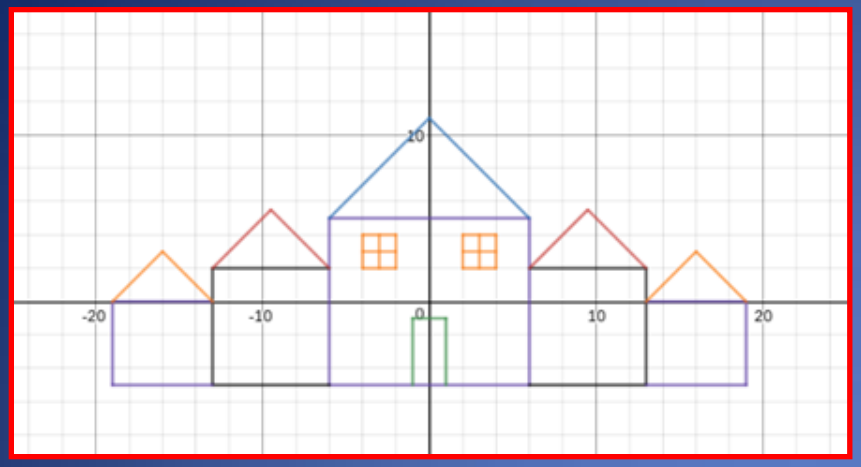
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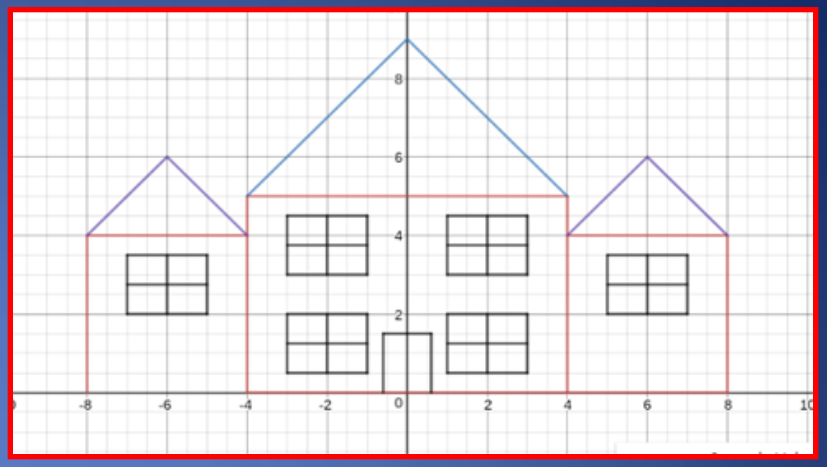
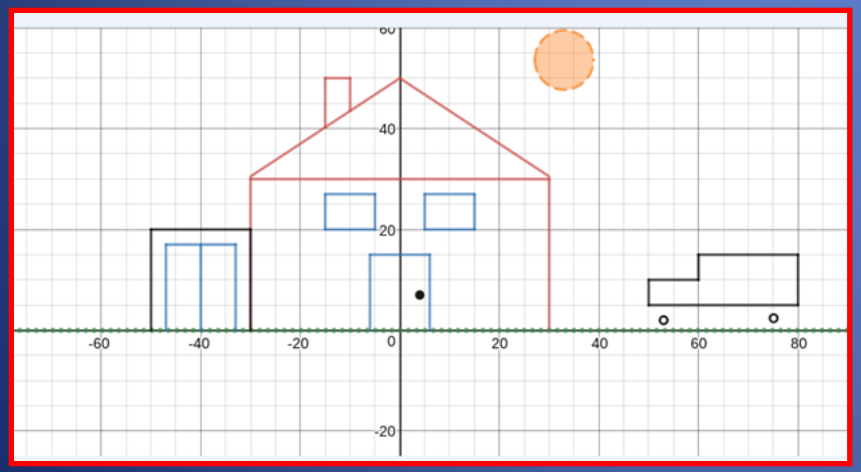
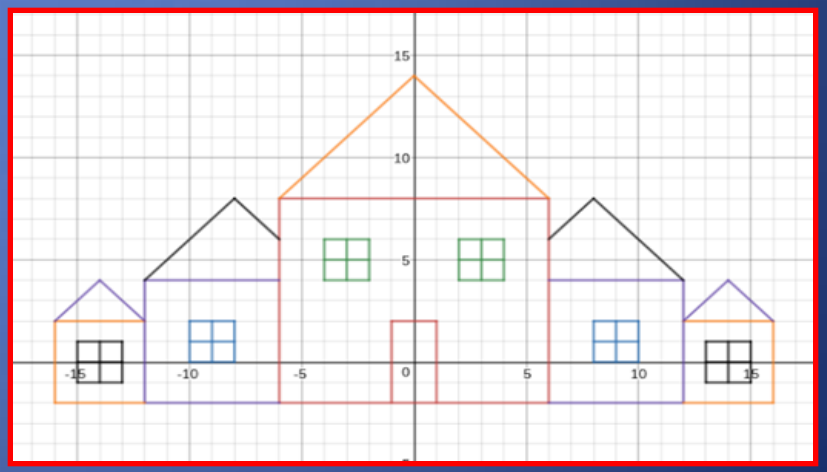
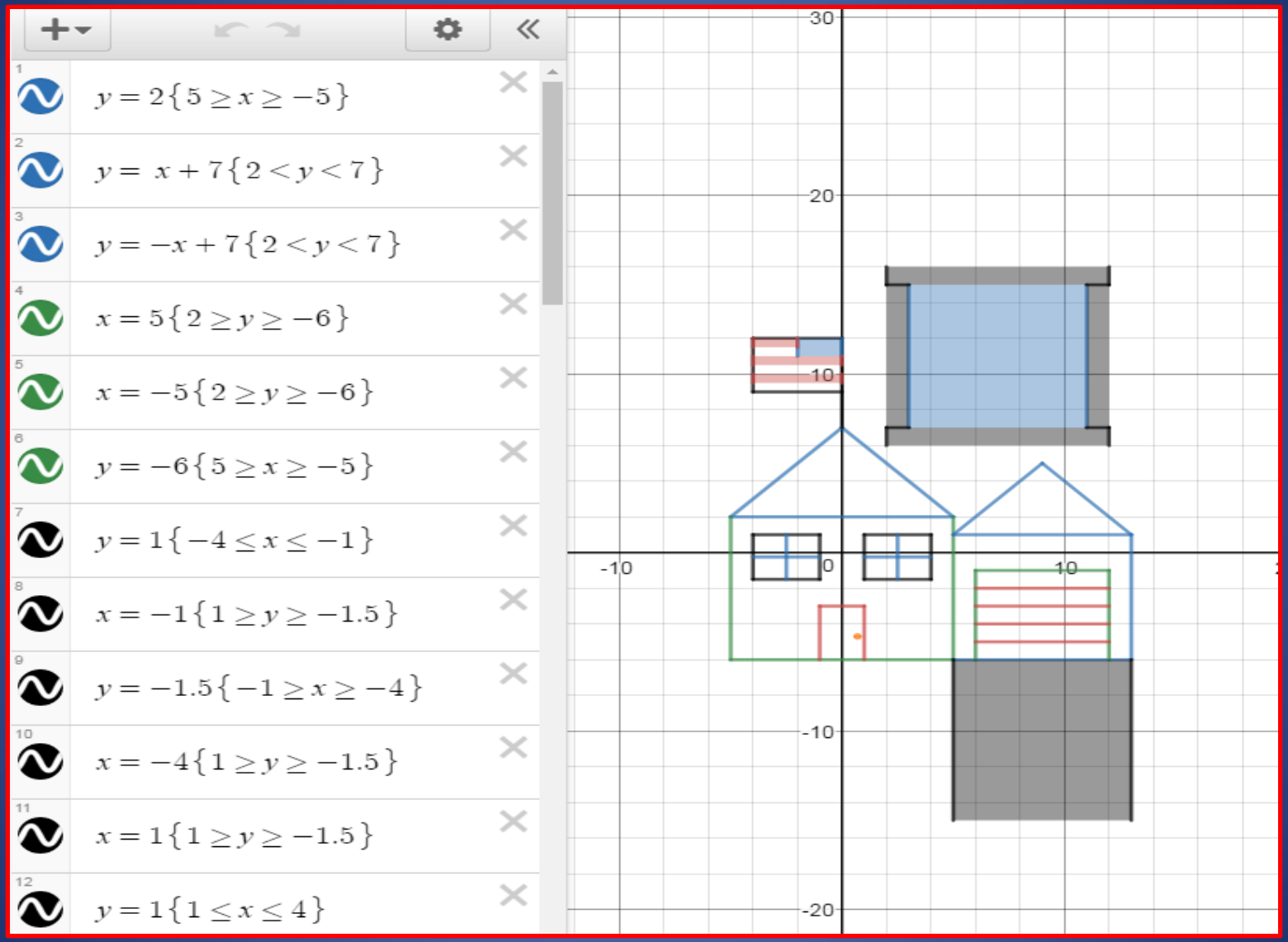
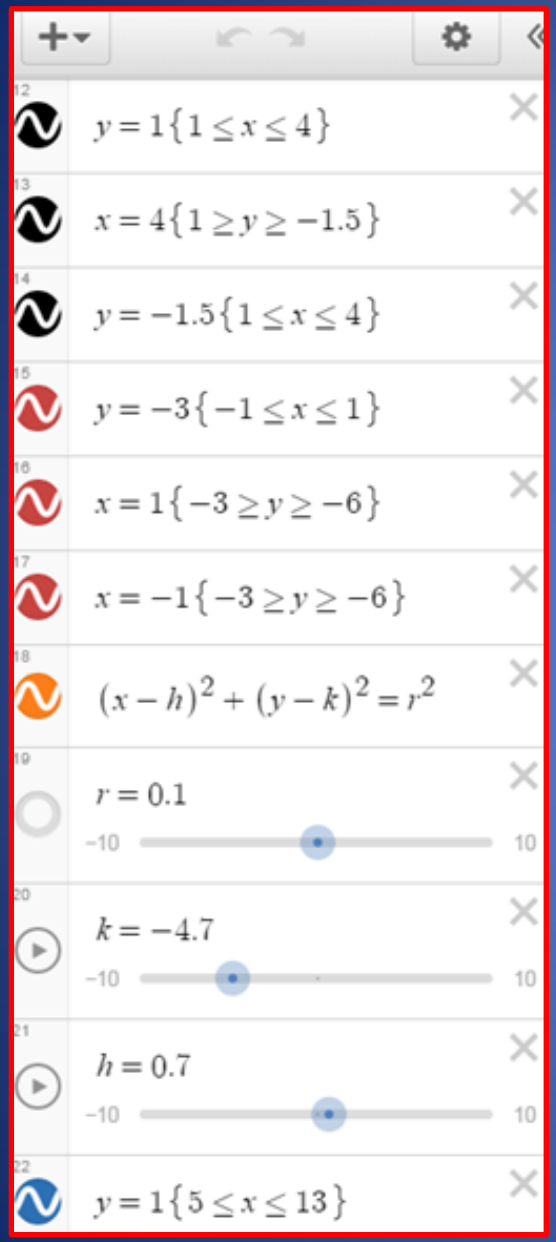

8
6
4
2
-8
-6
-4
-2
0
2
4
6
8
10


40
20
-60
-40
-20
0
20
40
60
80
-20

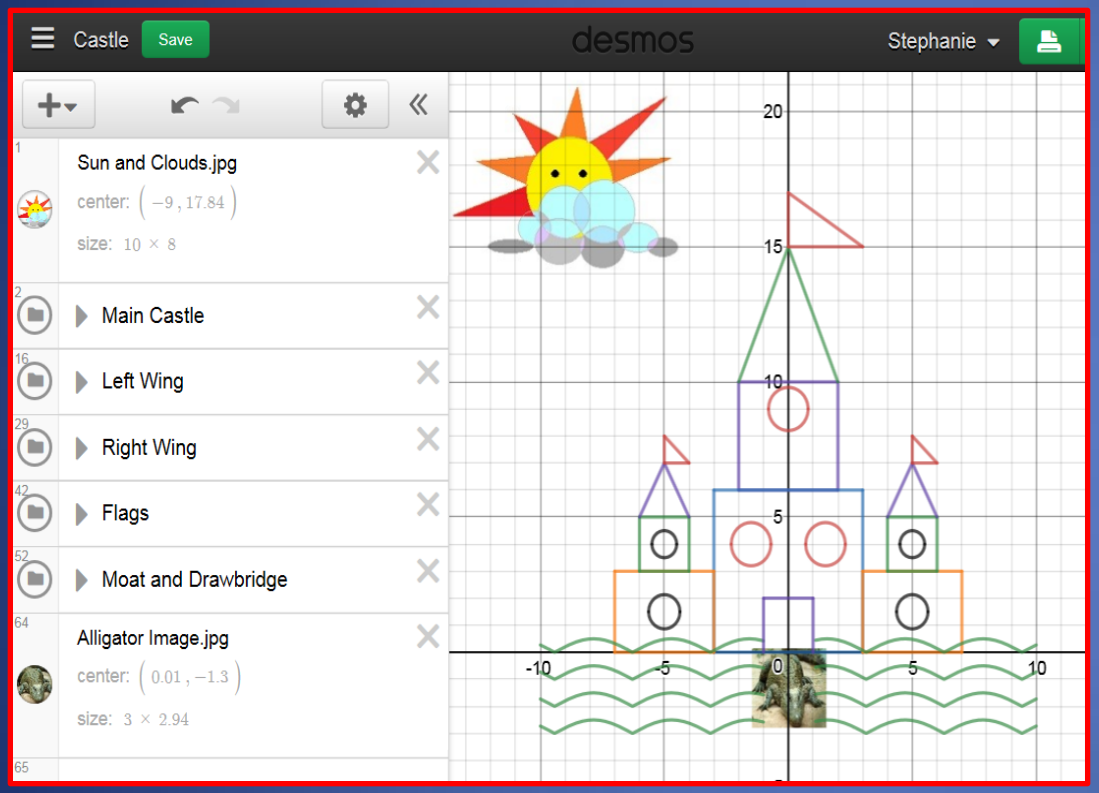

15
10
5
-15
-10
-5
0
5
10
15

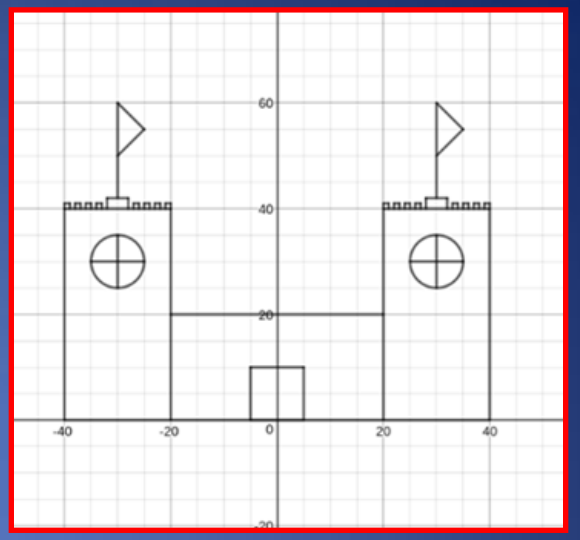

1 $y = 2\{5 \geq x \geq -5\}$
2 $y = x + 7\{2 < y < 7\}$
3 $y = -x + 7\{2 < y < 7\}$
4 $x = 5\{2 \geq y \geq -6\}$
5 $x = -5\{2 \geq y \geq -6\}$
6 $y = -6\{5 \geq x \geq -5\}$
7 $y = 1\{-4 \leq x \leq -1\}$
8 $x = -1\{1 \geq y \geq -1.5\}$
9 $y = -1.5\{-1 \geq x \geq -4\}$
10 $x = -4\{1 \geq y \geq -1.5\}$
11 $x = 1\{1 \geq y \geq -1.5\}$
12 $y = 1\{1 \leq x \leq 4\}$
30
20
10
-10
0
10
-10
-20

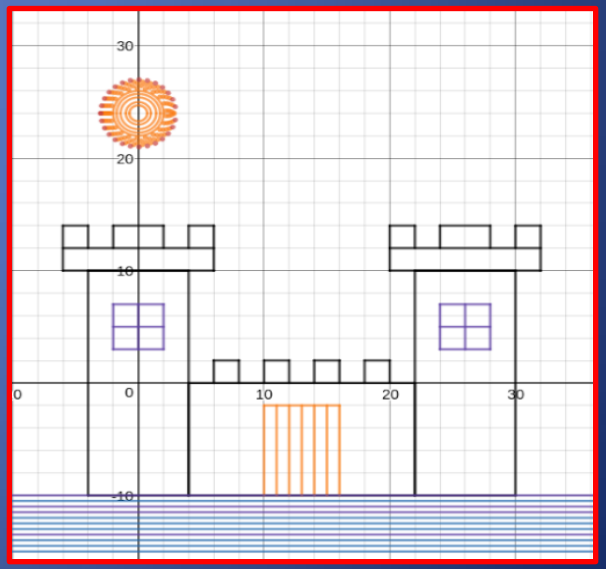

12 $y = 1\{1 \le x \le 4\}$
13 $x = 4\{1 \ge y \ge -1.5\}$
14 $y = -1.5\{1 \le x \le 4\}$
15 $y = -3\{-1 \le x \le 1\}$
16 $x = 1\{-3 \ge y \ge -6\}$
17 $x = -1\{-3 \ge y \ge -6\}$
18 $(x-h)^2 + (y-k)^2 = r^2$
19 $r = 0.1$
−10 10
20 $k = -4.7$
−10 10
21 $h = 0.7$
−10 10
22 $y = 1\{5 \le x \le 13\}$


$y = 1\{5 \le x \le 13\}$
23 $x = 13\{1 \ge y \ge -6\}$
24 $y = -6\{5 \le x \le 13\}$
25 $y = x + -4\{5 \le x \le 9\}$
26 $y = -x + 14\{13 \ge x \ge 9\}$
27 $x = 6\{-6 \le y \le -1\}$
28 $y = -1\{6 \le x \le 12\}$
29 $x = 12\{-1 \ge y \ge -6\}$
30 $y = -2\{6 \le x \le 12\}$
31 $y = -3\{6 \le x \le 12\}$
32 $y = -4\{6 \le x \le 12\}$
33 $y = -5\{6 \le x \le 12\}$


$x = -2.5\{1 \ge y \ge -1.5\}$
35 $x = 2.5\{1 \ge y \ge -1.5\}$
36 $y = -.25\{-4 \le x \le -1\}$
37 $y = -.25\{1 \le x \le 4\}$
38 $x = 0\{7 \le y \le 12\}$
39 $y = 12\{0 \ge x \ge -4\}$
40 $x = -4\{12 \ge y \ge 9\}$
41 $y = 9\{-4 \le x \le 0\}$
42 $-2 \le x \le 0\{11 < y < 12\}$
43 $-4 \le x \le -2\{11.5 < y < 12\}$
44 $-4 \le x \le 0\{10.5 < y < 11\}$
45 $-4 \le x \le 0\{9.5 < y < 10\}$


Castle
Save
desmos
Stephanie
Sun and Clouds.jpg
center: (−9, 17.84)
size: 10 × 8
Main Castle
Left Wing
Right Wing
Flags
Moat and Drawbridge
Alligator Image.jpg
center: (0.01, −1.3)
size: 3 × 2.94





http://support.desmos.com/hc/en-us/articles/203291245-Add-Image-to-Graph

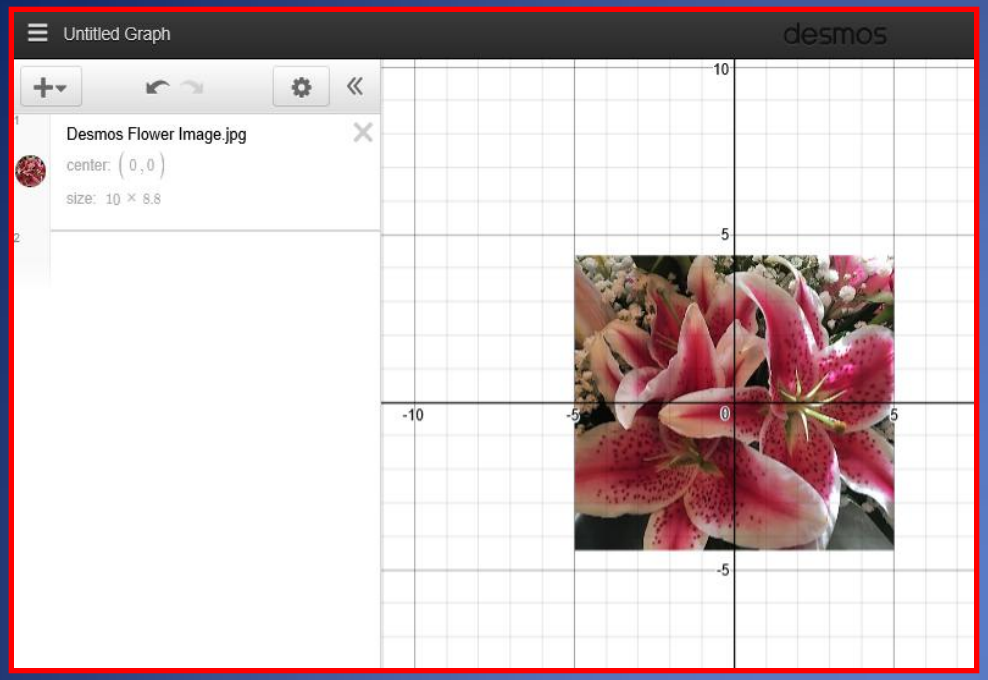
Add Image to Graph

Team Desmos
Friday at 14:42

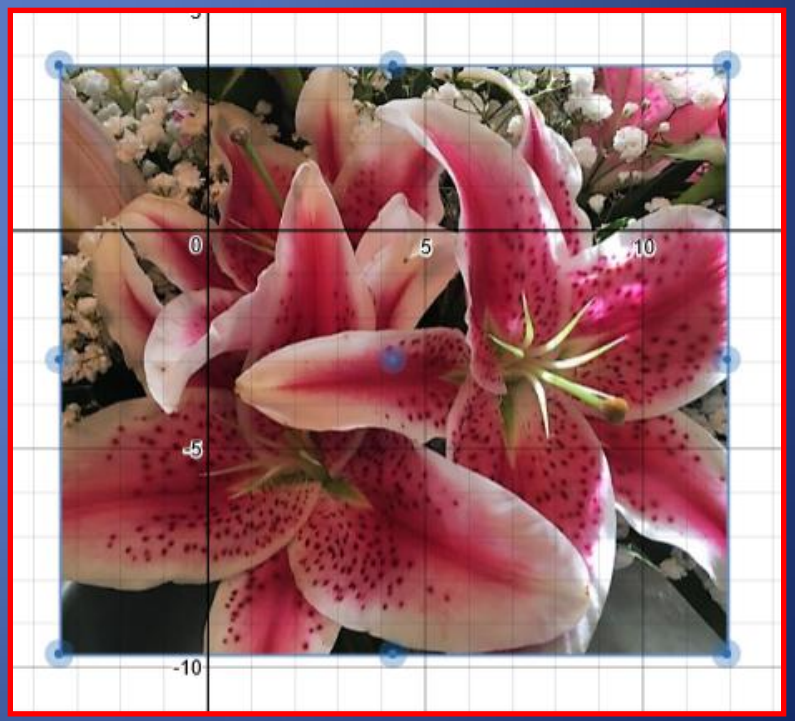
Follow

Add images to your graph to use as a template for your graph, add text labels, or for a little pop of extra color! To add an image to your graph, start by opening the **Add Item** menu and choose **Image**. Clicking and dragging the image into the expression list is also supported in many browsers.

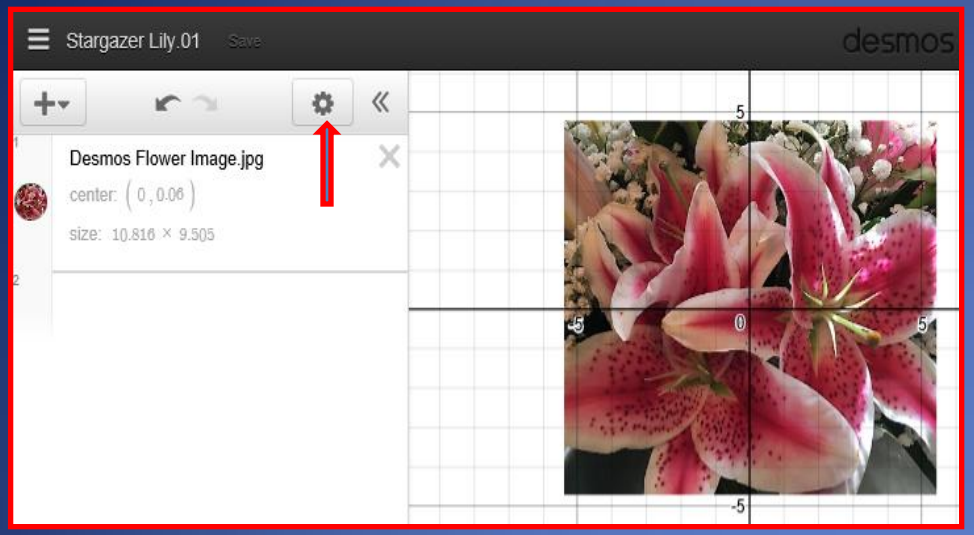
To **Move** the image, click on the center point and drag the image to where you'd like to place it. Or, you can manually change the coordinate of the center point in the expression list. This will automatically move the image so that its center is at that new coordinate point. To **Resize** the image, click and drag any one of the outer points surrounding the image and drag outwards to make larger and inwards to make smaller.

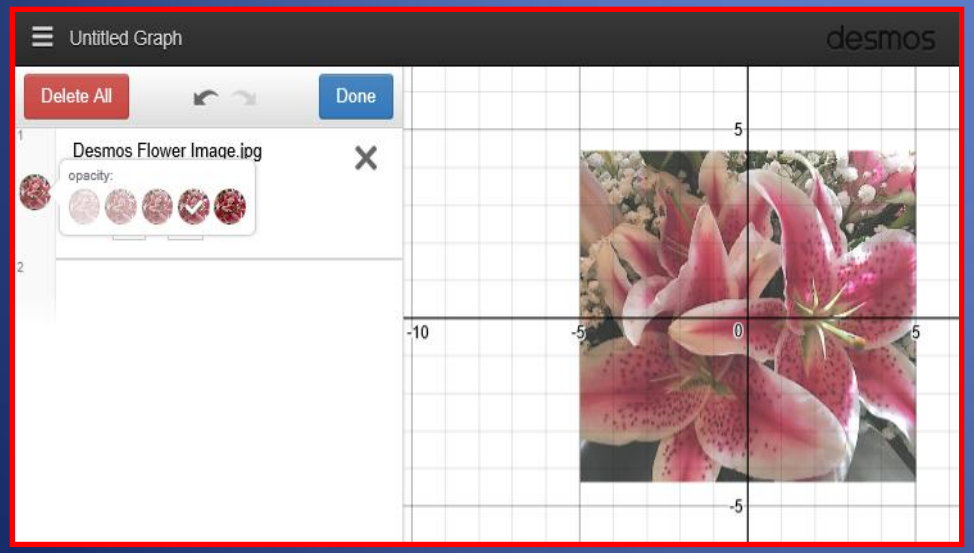


The flower image is centered at the origin. It can be resized and moved to another location.



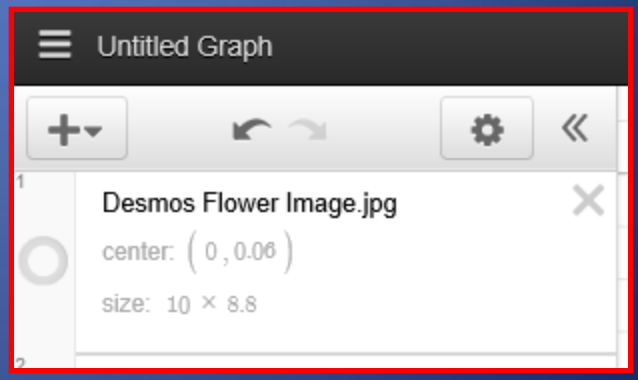
Now is a good time to Save your file. You must be signed in to do that. We use our Google sign-in and a unique password.

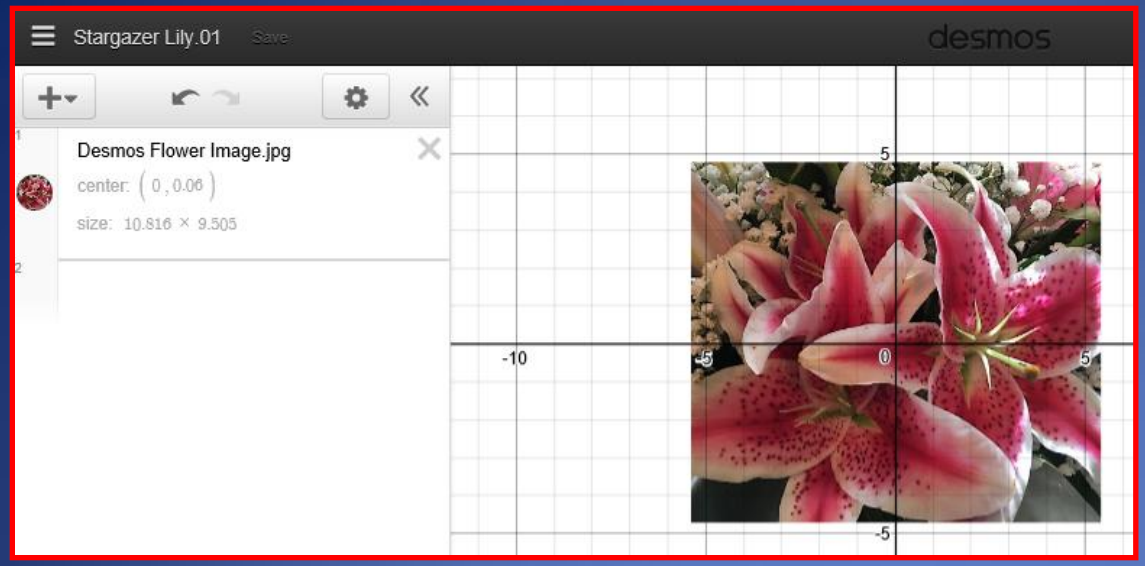




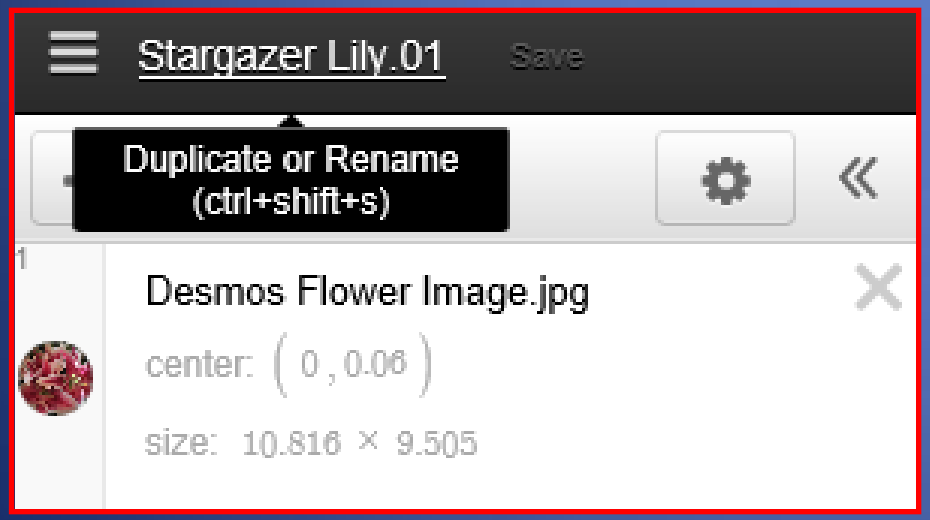
Click and hold the little gear icon above the image block. Now you can control the opacity of the picture.

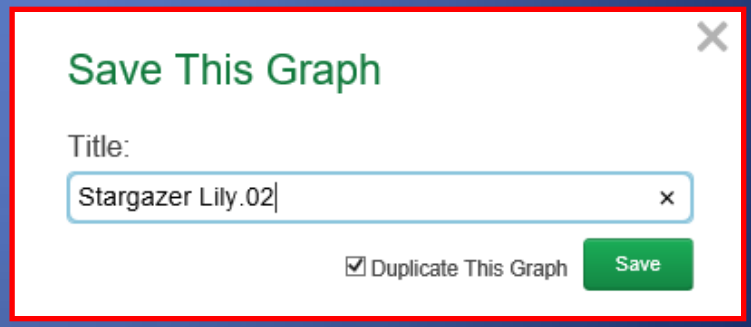
You can also click on the little flower icon and make the image invisible!





You may want to duplicate your file so you can add something later. Keep the original but save a copy with a new name.





Steps to Save A Photo:

1. Take photo with phone, tablet, or Chrome book.
2. Next, email the picture from your phone to your school email
3. Then, save it to your Google Drive by downloading it.
4. Import from your Google Drive into Desmos.

http://support.desmos.com/hc/en-us/articles/205841709-Connecting-Coordinate-Points

desmos

Desmos > Graphing Features > Features

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Connecting Coordinate Points

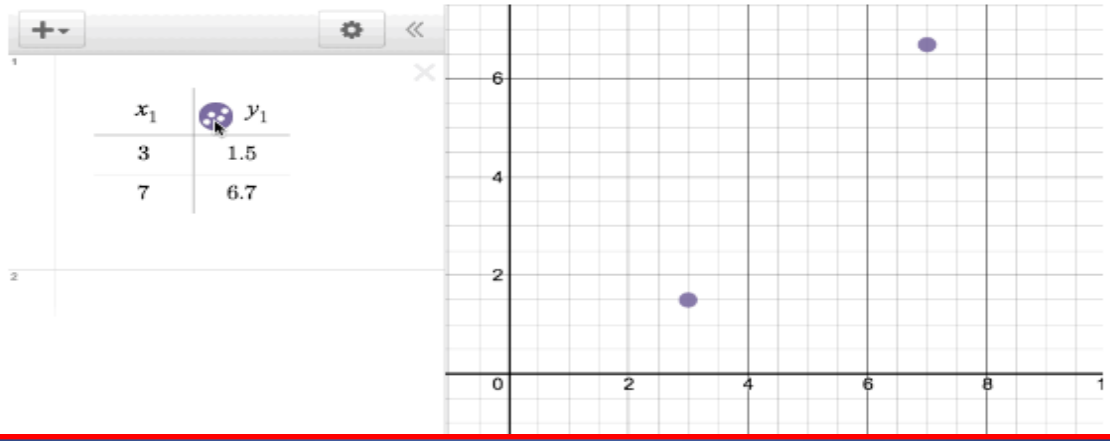
Team Desmos
January 27, 2017 14:00

Follow

There are multiple ways to connect points in a line depending on the style and substance you're looking for.

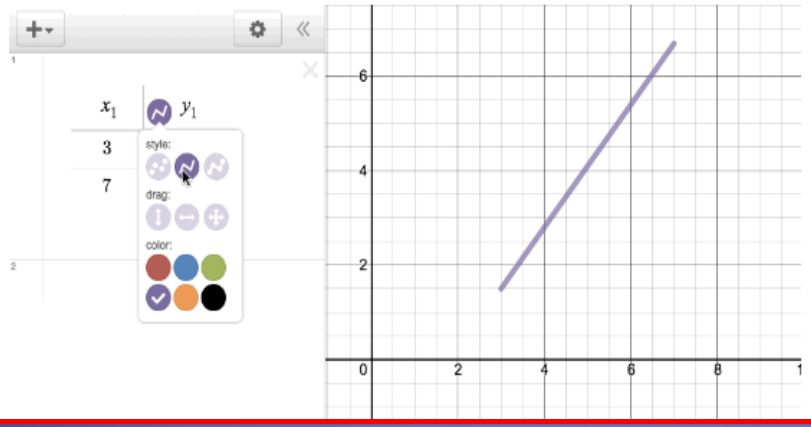
1.) Using a Table to Connect Coordinate Points

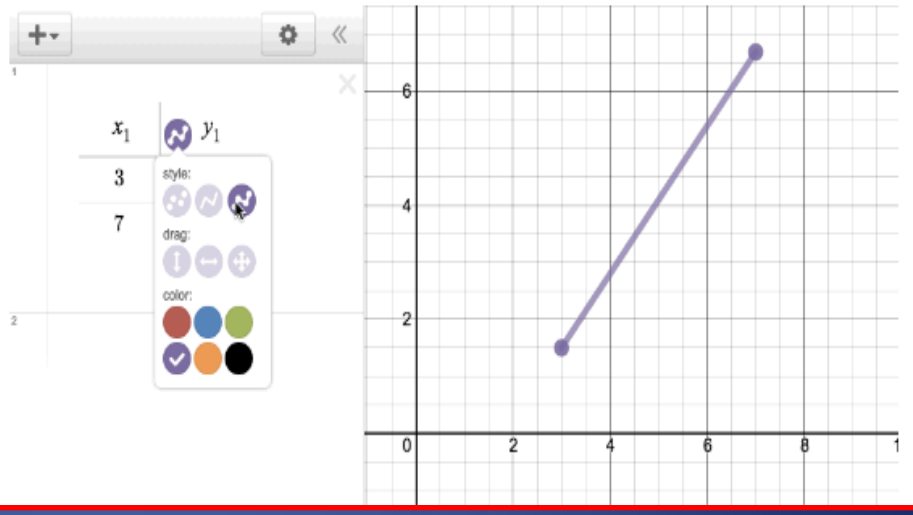
When creating a table in Desmos, points can be connected by clicking and long-holding the icon next to the dependent column header. Choose from two different styles. This is also a great way to graph shapes in the calculator.



1.) Using a Table to Connect Coordinate Points

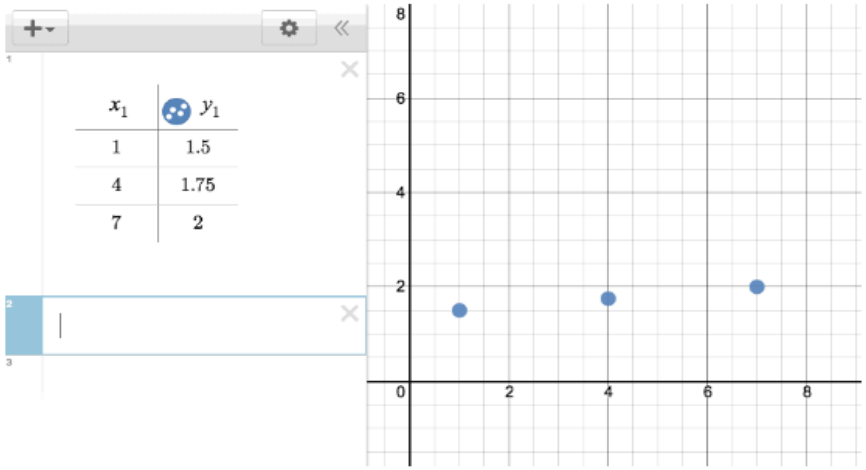
When creating a table in Desmos, points can be connected by clicking and long-holding the icon next to the dependent column header. Choose from two different styles. This is also a great way to graph shapes in the calculator.





2.) Using Linear Regression to Connect Points

Points that display a linear pattern can be connected with an extended line by running a linear regression on the table data.

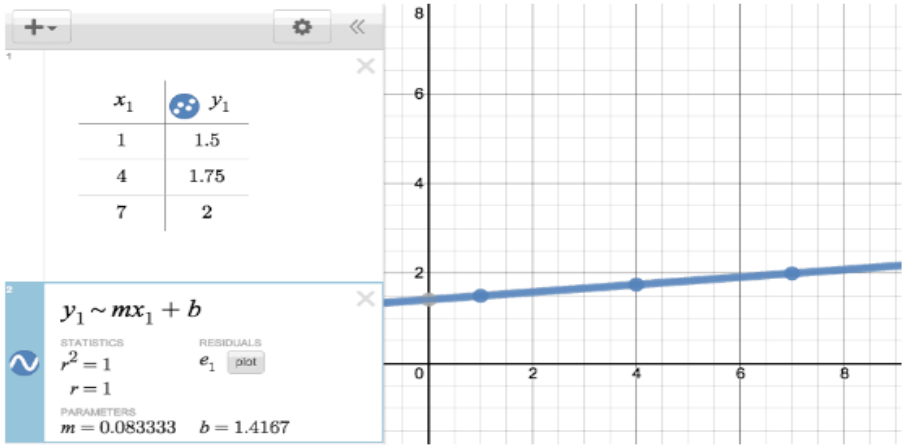


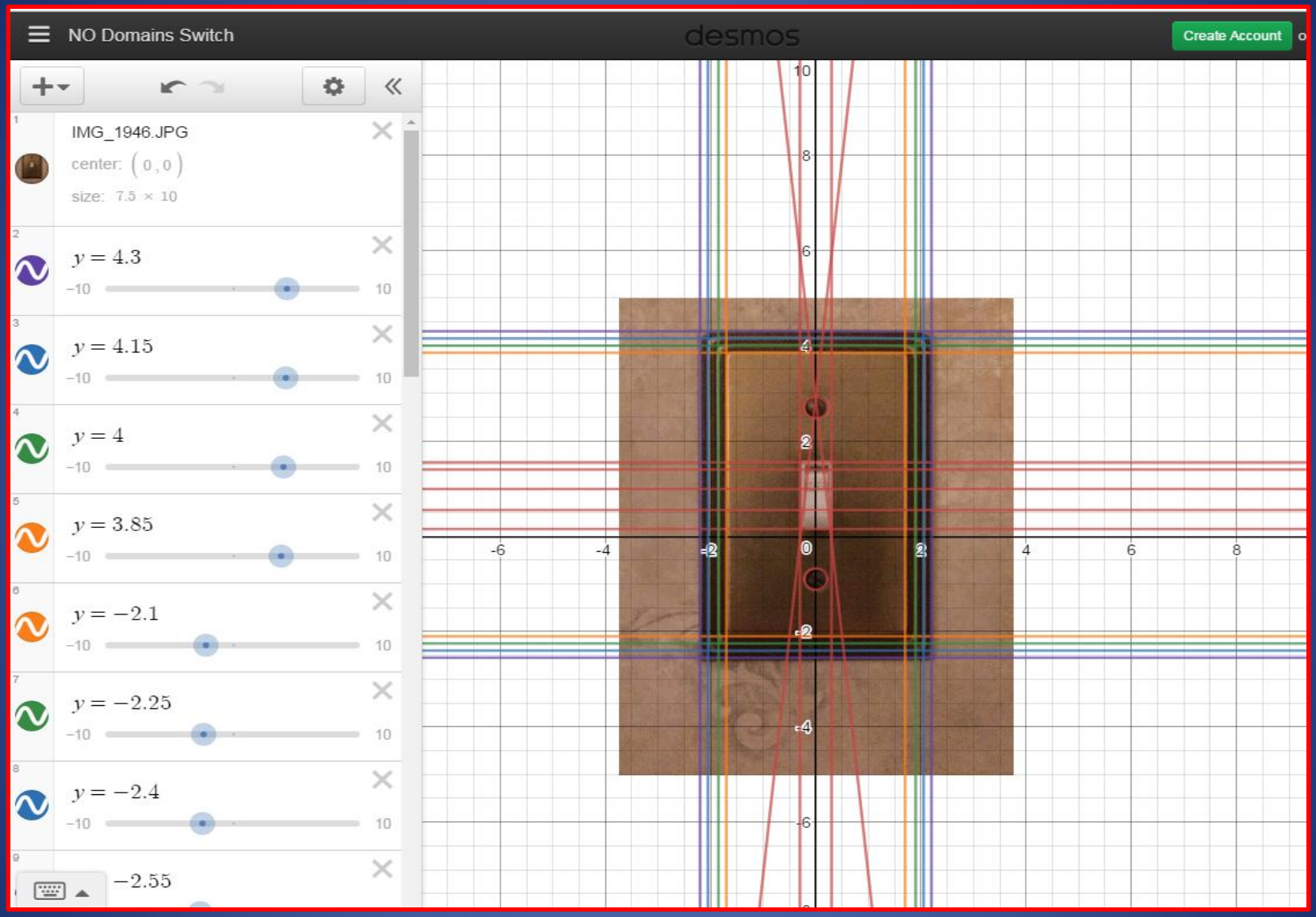
$y_{\#} \sim mx_{\#} + b$

$y_1 \sim mx_1 + b$

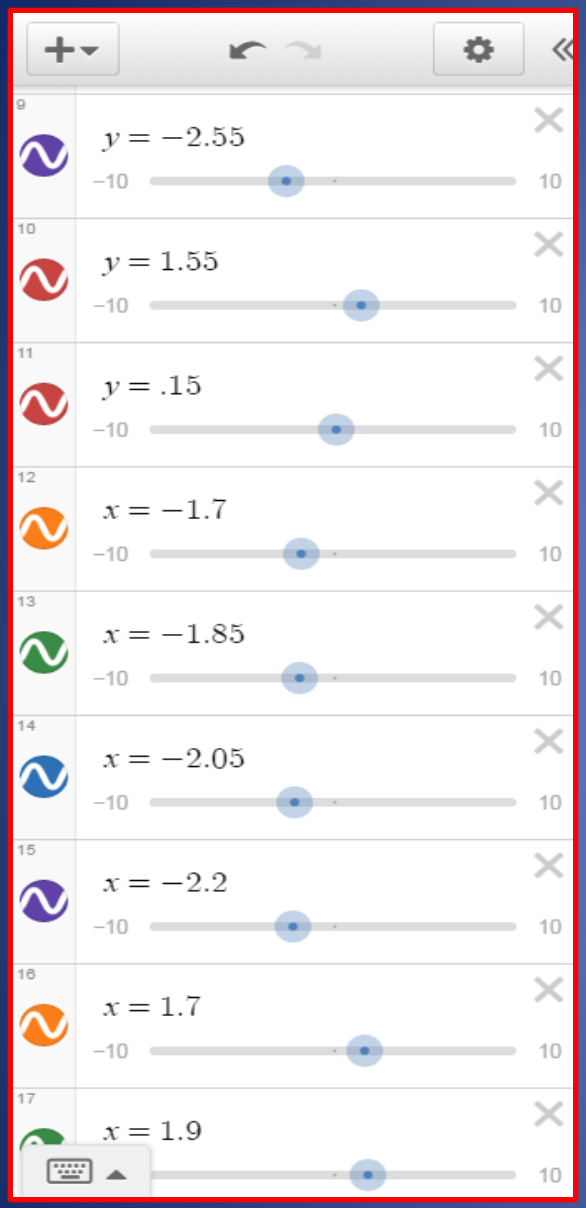
2.) Using Linear Regression to Connect Points

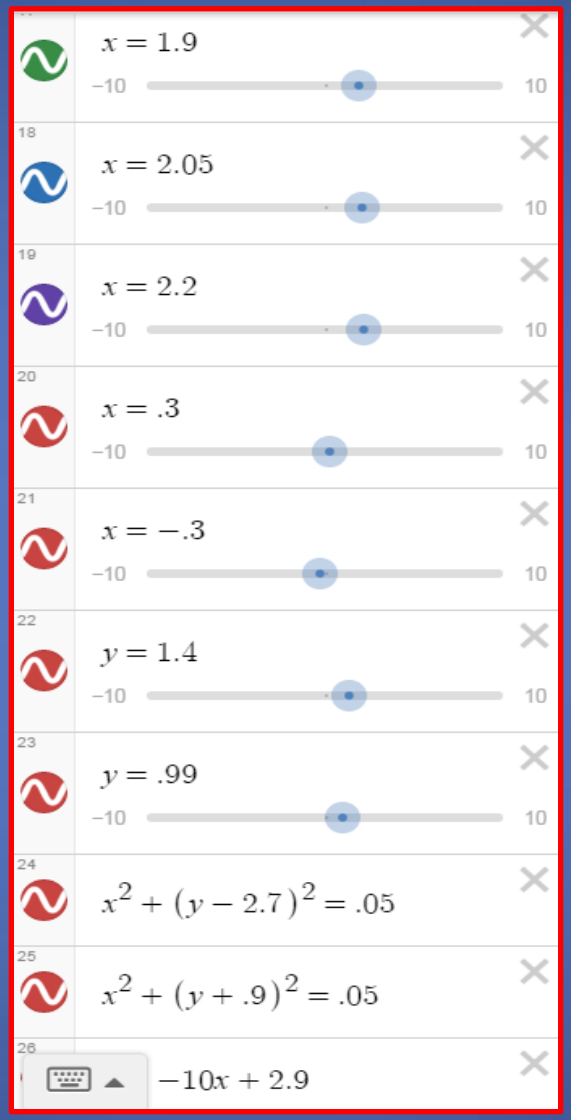
Points that display a linear pattern can be connected with an extended line by running a linear regression on the table data.

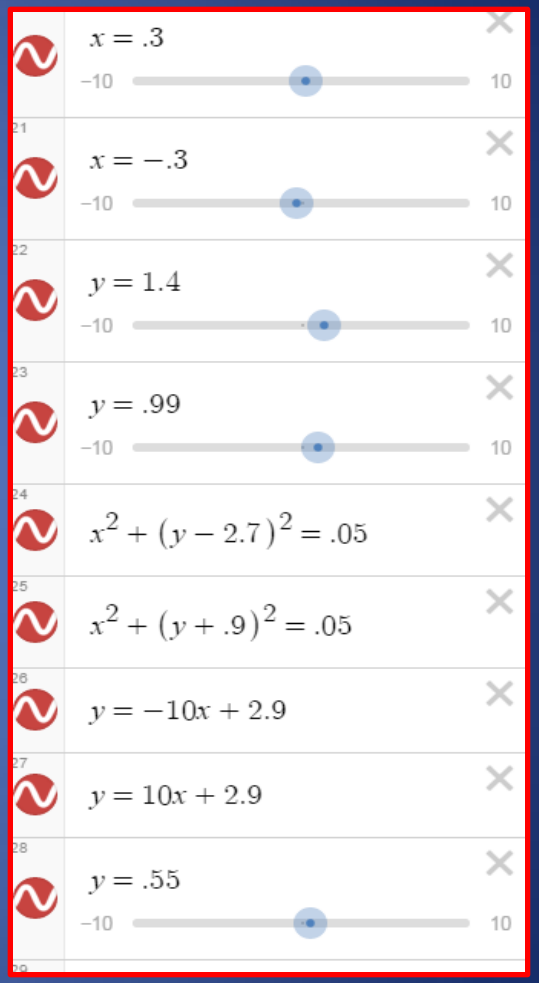




Switchplate.01







Switchplate.02

1 IMG_1946.JPG

center: $(0, 0)$

size: 7.5×10

2 $y = 4.3\{-2.2 < x < 2.2\}$

3 $y = 4.15\{-2.05 < x < 2\}$

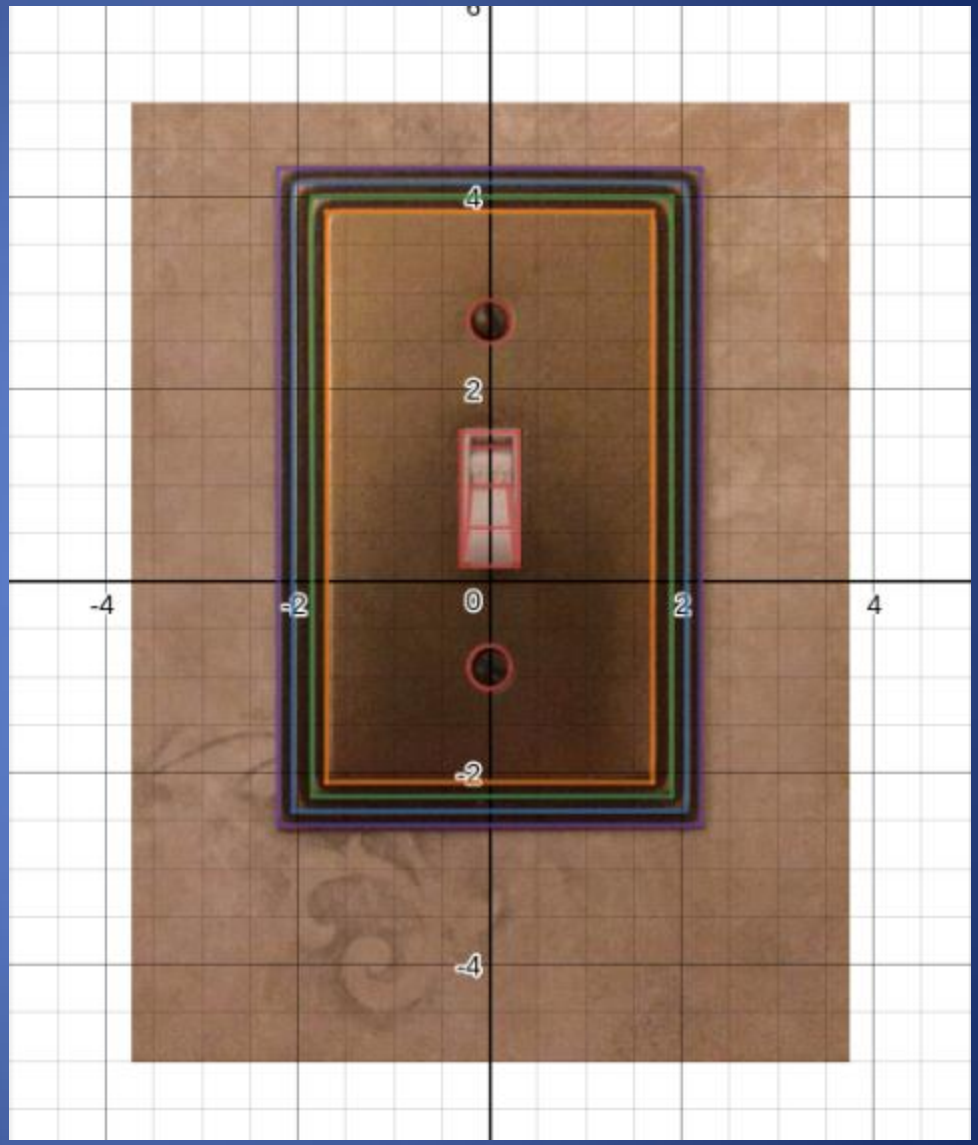
4 $y = 4\{-1.85 < x < 1.9\}$

5 $y = 3.85\{-1.7 < x < 1.7\}$

6 $y = -2.1\{-1.7 < x < 1.7\}$

7 $y = -2.25\{-1.85 < x < 1.9\}$

8 $y = -2.4\{-2.05 < x < 2\}$



Switchplate.03

9 $y = -2.55\{2.2 > x > -2.2\}$

10 $y = 1.55\{.3 > x > -.3\}$

11 $y = .15\{.3 > x > -.3\}$

12 $x = -1.7\{3.85 > y > -2.1\}$

13 $x = -1.85\{-2.24 < y < 4\}$

14 $x = -2.05\{4.1 > y > -2.4\}$

15 $x = -2.2\{4.28 > y > -2.51\}$

16 $x = 1.7\{3.85 > y > -2.1\}$

17 $x = 1.9\{-2.24 < y < 4\}$

18 $x = 2.05\{4.14 > y > -2.4\}$

19 $x = 2.2\{4.28 > y > -2.51\}$

20 $x = .3\{1.56 > y > .2\}$

21 $x = -.3\{1.56 > y > .2\}$

22 $y = 1.4\{.2 > x > -.2\}$

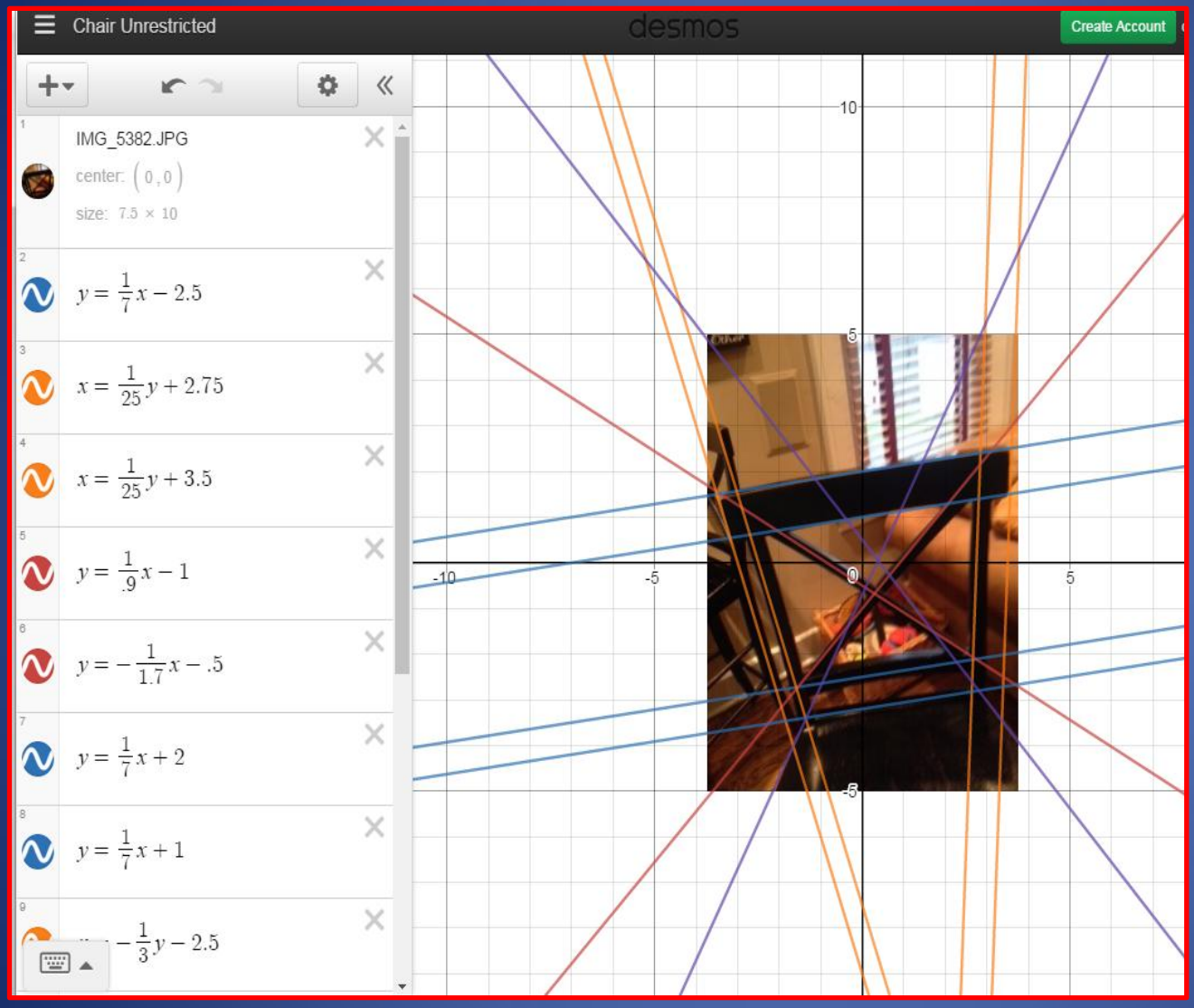
23 $y = .99\{.2 > x > -.2\}$

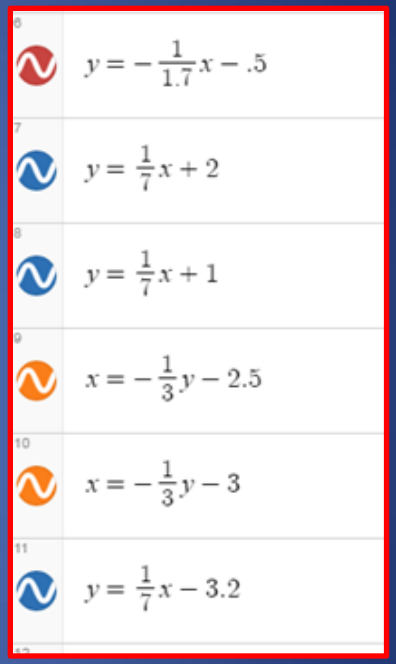
24 $x^2 + (y - 2.7)^2 = .05$

25 $x^2 + (y + .9)^2 = .05$

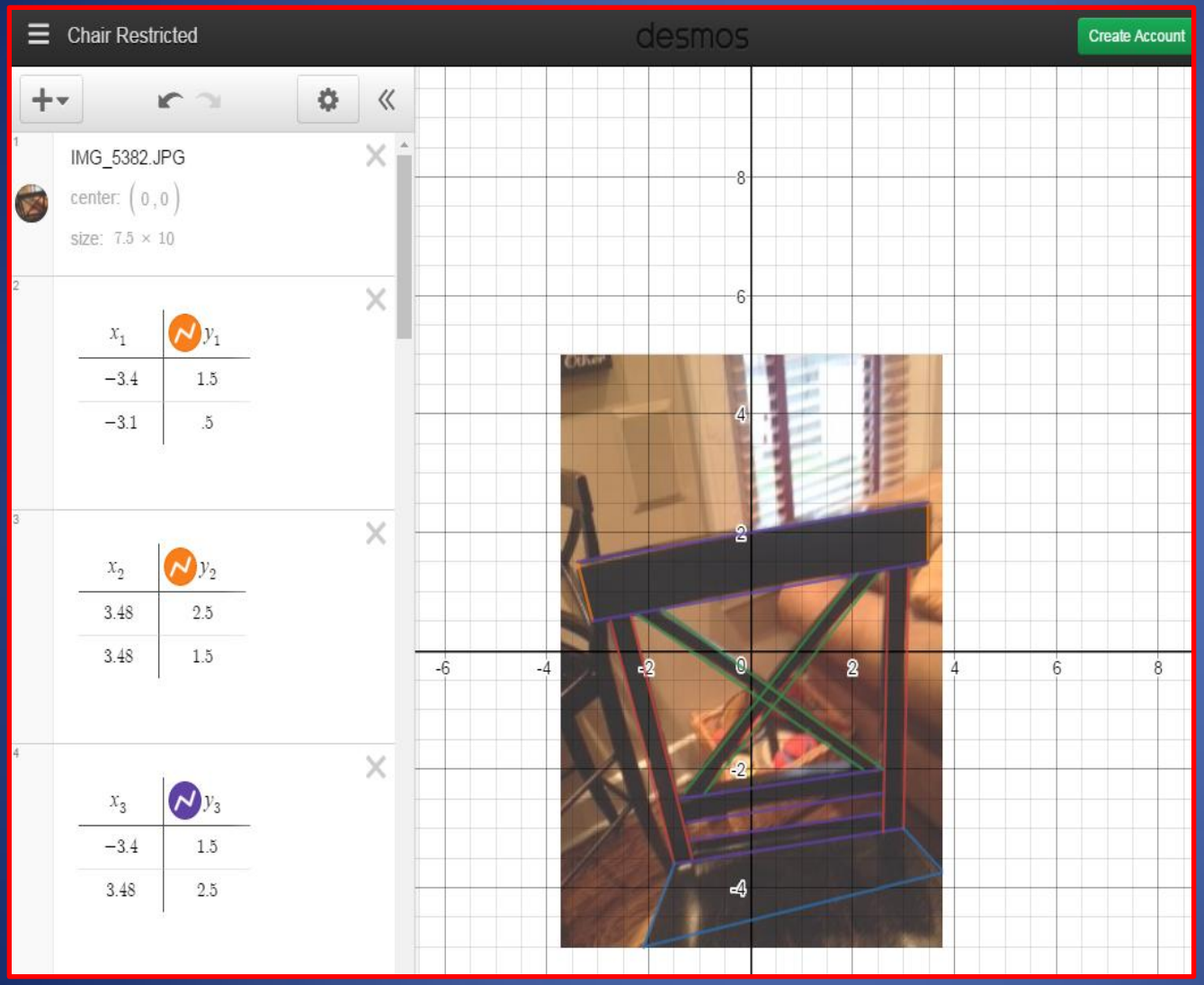
26 $y = -10x + 2.9\{.19 < x < .27$

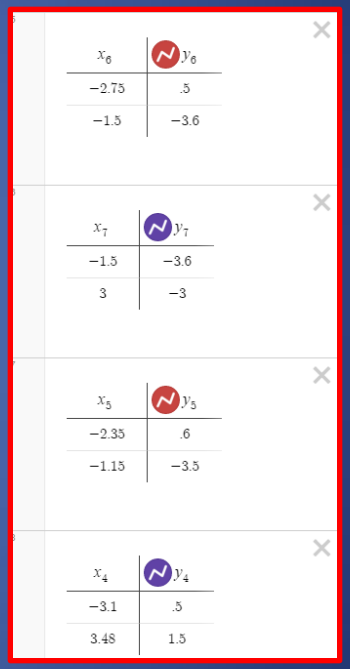
Switchplate.04


Chair Unrestricted
desmos
Create Account
IMG_5382.JPG
center: (0 , 0)
size: 7.5 × 10
$y = \frac{1}{7}x - 2.5$
$x = \frac{1}{25}y + 2.75$
$x = \frac{1}{25}y + 3.5$
$y = \frac{1}{9}x - 1$
$y = -\frac{1}{1.7}x - .5$
$y = \frac{1}{7}x + 2$
$y = \frac{1}{7}x + 1$
$-\frac{1}{3}y - 2.5$
10
5
-5
-10
-5
0
5


$y = -\frac{1}{1.7}x - .5$
$y = \frac{1}{7}x + 2$
$y = \frac{1}{7}x + 1$
$x = -\frac{1}{3}y - 2.5$
$x = -\frac{1}{3}y - 3$
$y = \frac{1}{7}x - 3.2$

Chair.01


Chair Restricted
desmos
Create Account
IMG_5382.JPG
center: (0 , 0)
size: 7.5 × 10
x_1 y_1
−3.4 1.5
−3.1 .5
x_2 y_2
3.48 2.5
3.48 1.5
x_3 y_3
−3.4 1.5
3.48 2.5
8
6
4
2
-2
-4
-6
-4
-2
0
2
4
6
8


x_6 y_6
−2.75 .5
−1.5 −3.6
x_7 y_7
−1.5 −3.6
3 −3
x_5 y_5
−2.35 .6
−1.15 −3.5
x_4 y_4
−3.1 .5
3.48 1.5

Chair.02

x_8	y_8
3.1	1.4
3	−3

x_9	y_9
2.7	1.32
2.6	−3.05

x_{11}	y_{11}
−1.4	−2.5
2.6	−2

x_{10}	y_{10}
−1.2	−3.2
2.55	−2.75

x_{14}	y_{14}
−1.75	.7
2.6	−2

x_{13}	y_{13}
−2.2	.6
2.2	−2

x_{15}	y_{15}
2.1	1.3
−1.3	−2.4

x_{12}	y_{12}
−1.25	−2.9
2.6	−2.4

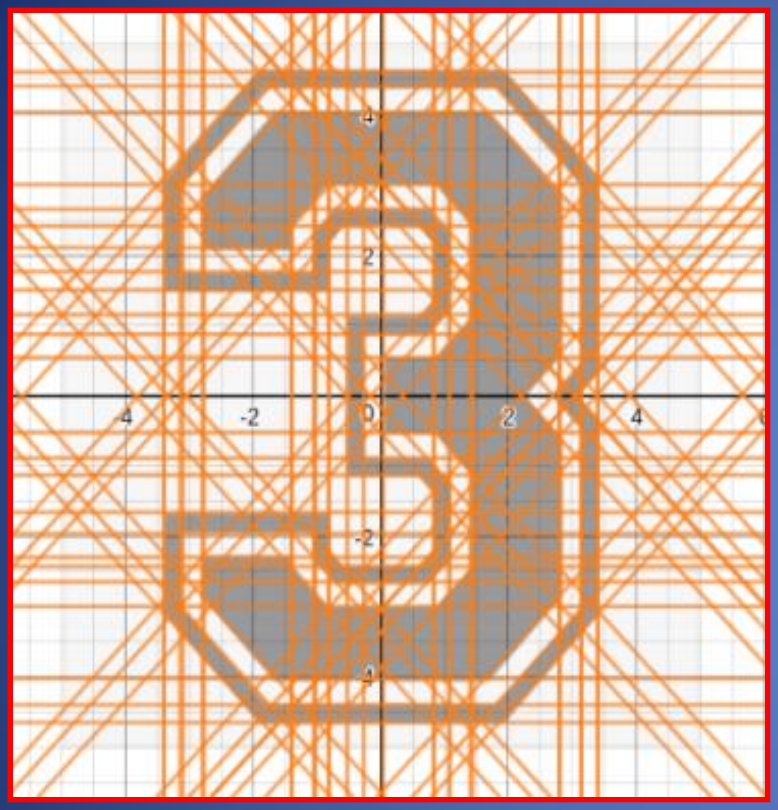
x_{18}	y_{18}
3	−3
3.75	−3.7

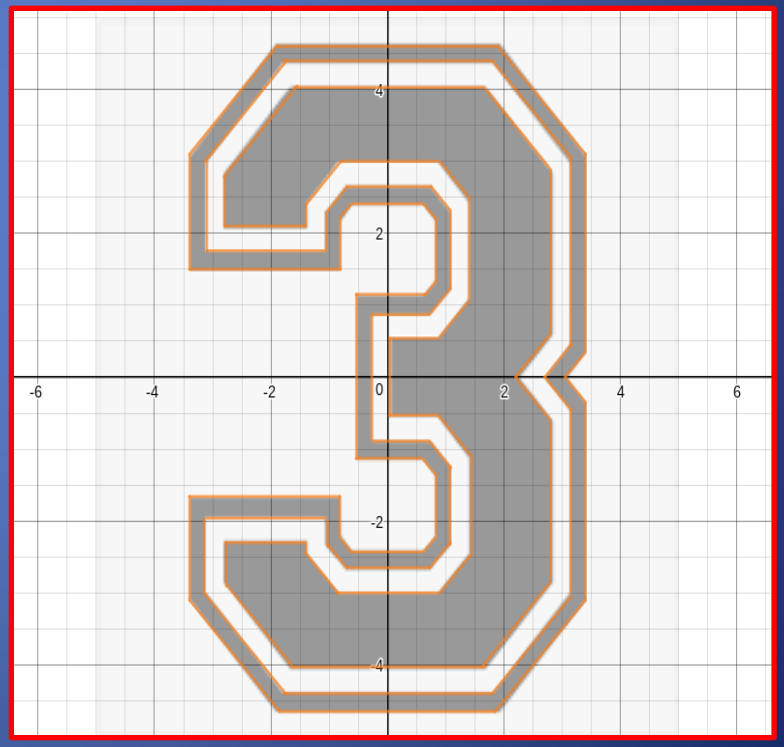
x_{19}	y_{19}
−2.1	−5
3.75	−3.75

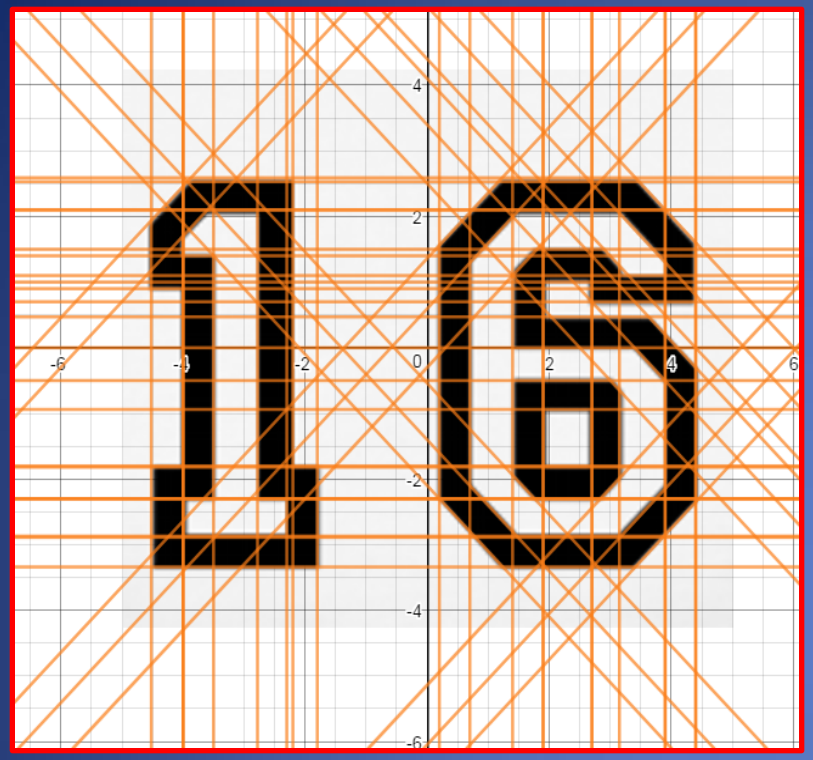
x_{17}	y_{17}
−1.5	−3.6
−2.1	−5

x_{16}	y_{16}
2.5	1.3
−.9	−2.4

Chair.03


4
2
-4
-2
0
2
4
-2
-4


4
2
-6
-4
-2
0
2
4
6
-2
-4


4
2
-6
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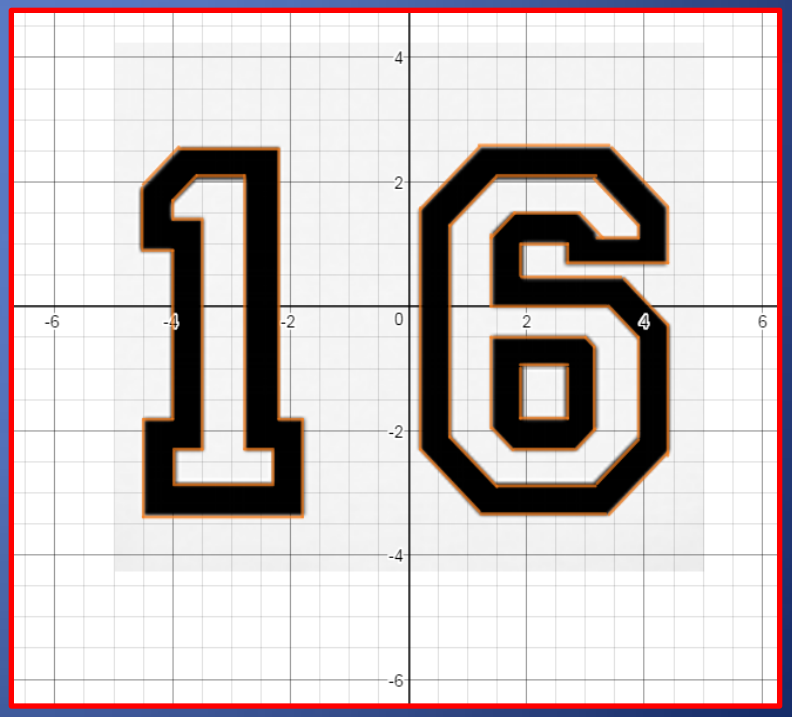
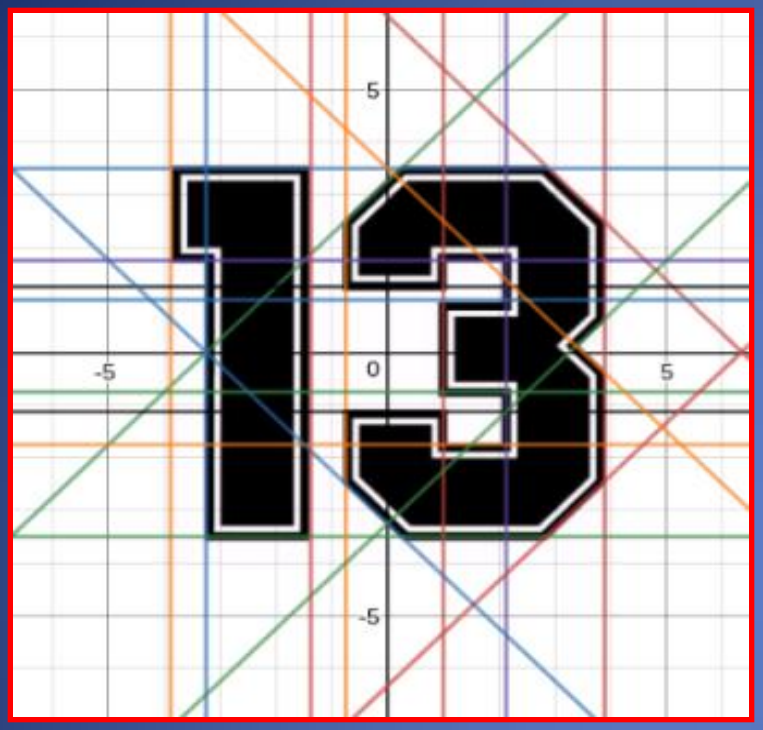
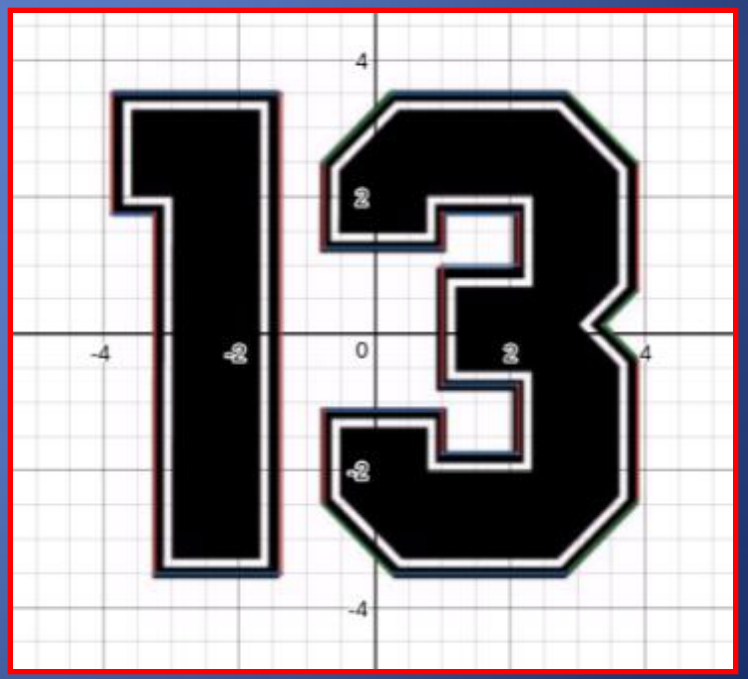
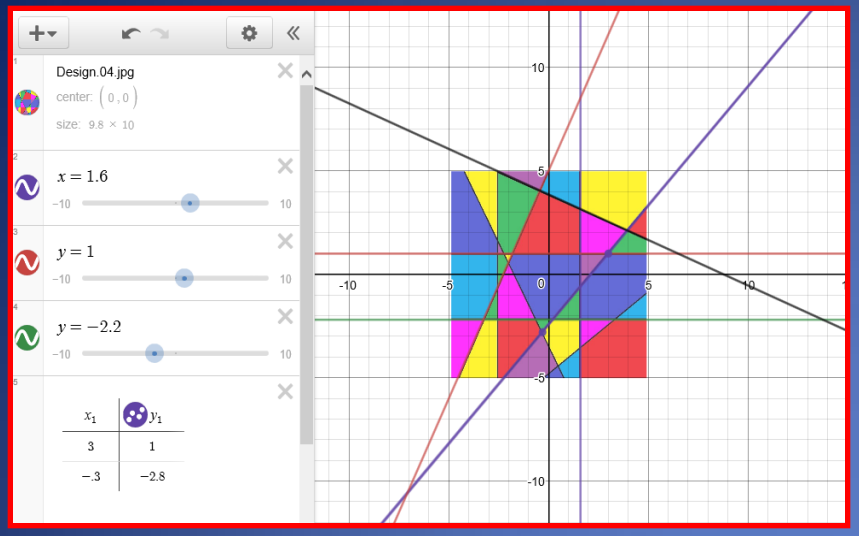
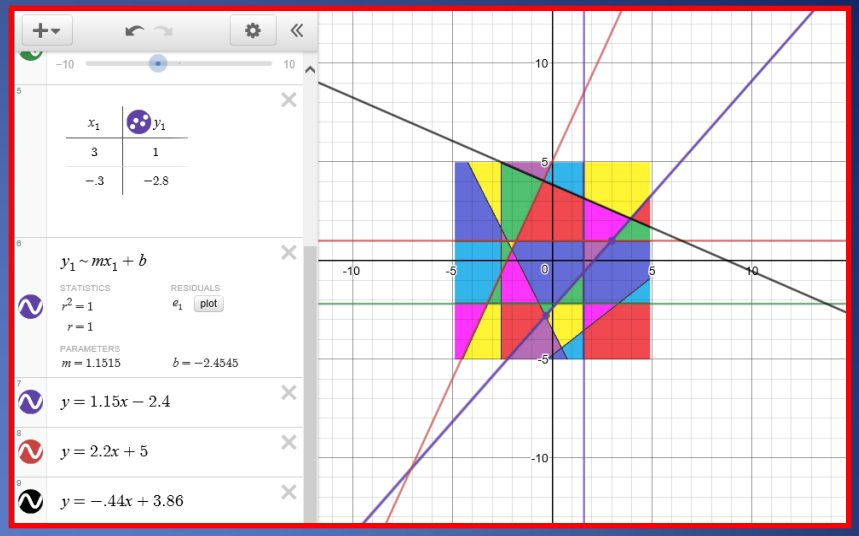
-2
0
2
4
6
-2
-4
-6

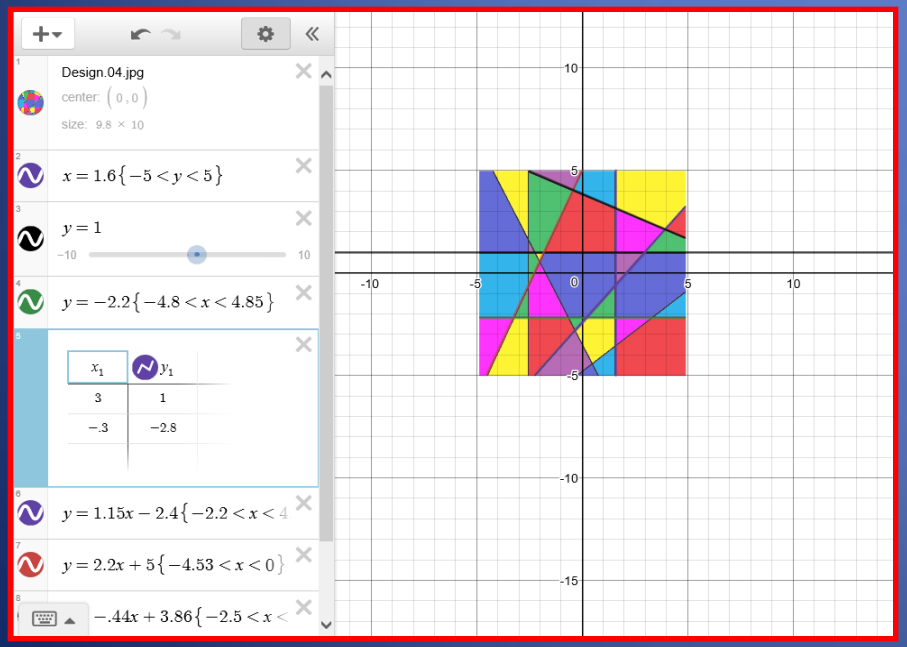

4
2
-6
-4
-2
0
2
4
6
-2
-4
-6


5
-5
0
5
-5

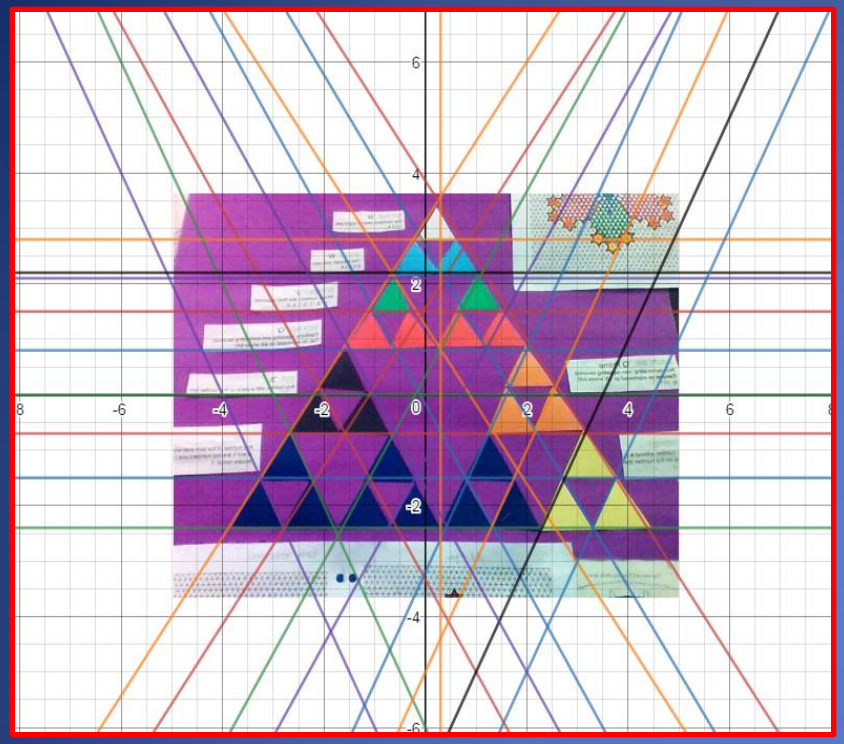

4
-4
0
4
-4







This graphic design was done in a Paint document and saved as a jpeg so it could be inserted onto a new set of coordinate axes. The picture on the left shows the beginning of the restrictions on the equations.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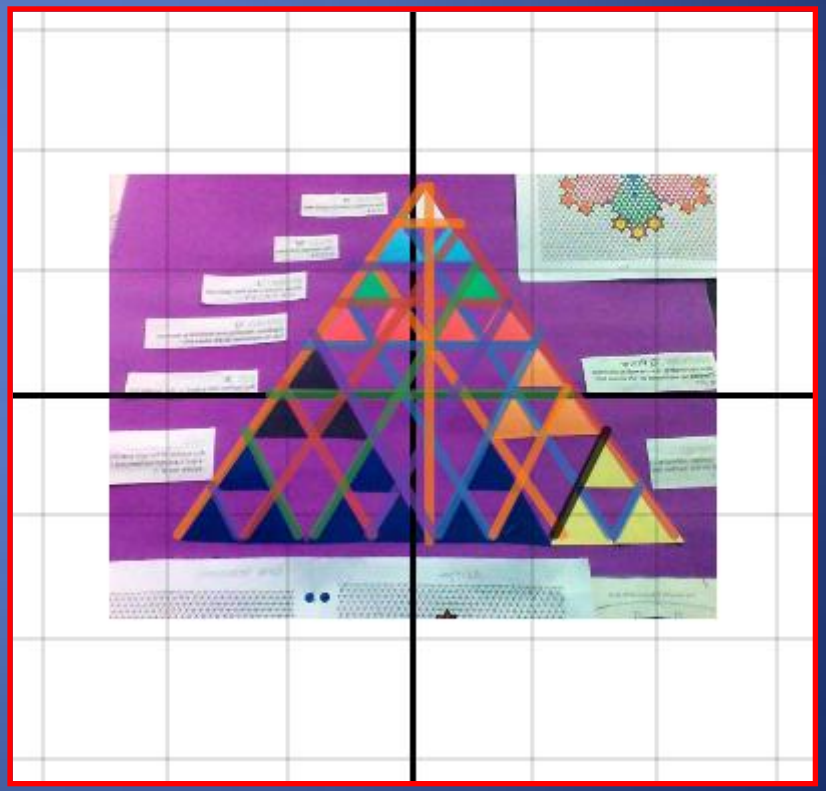

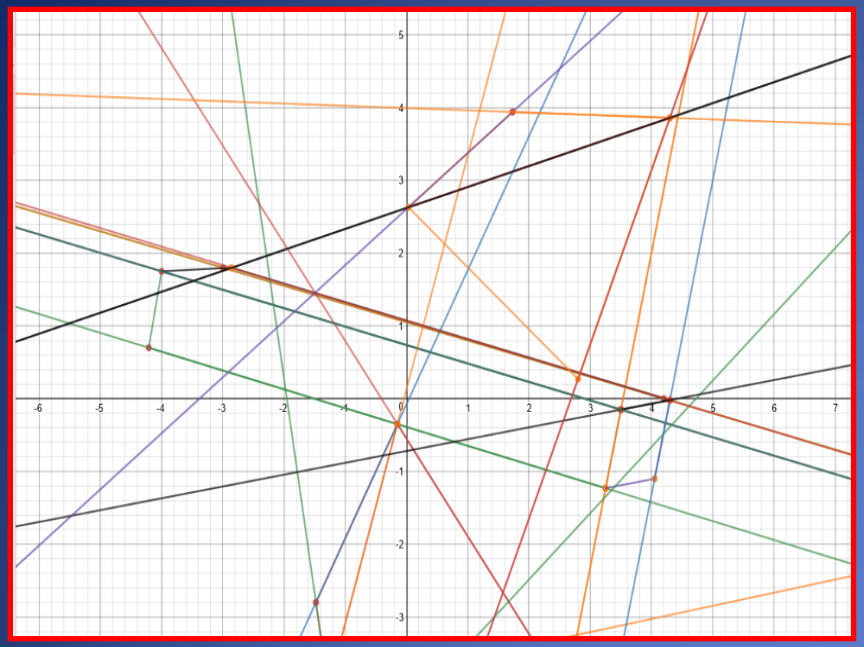

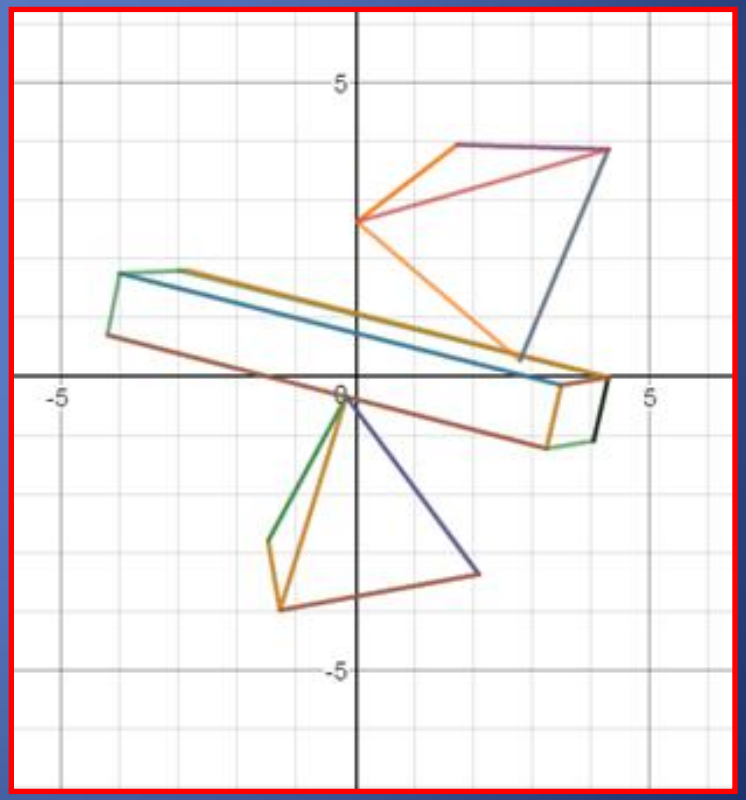
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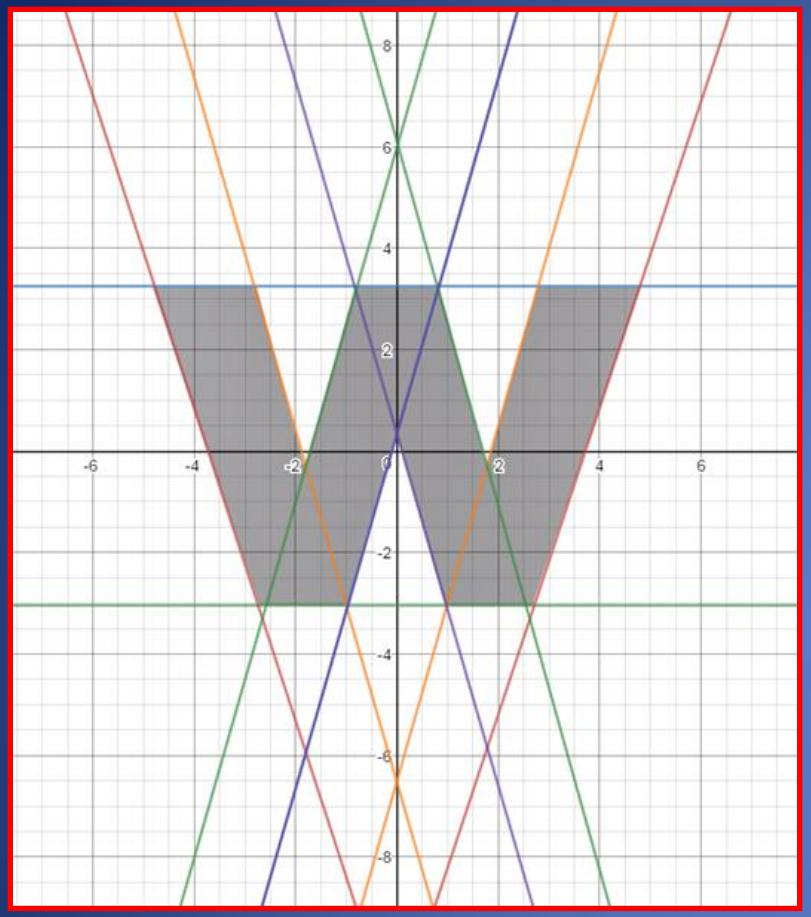
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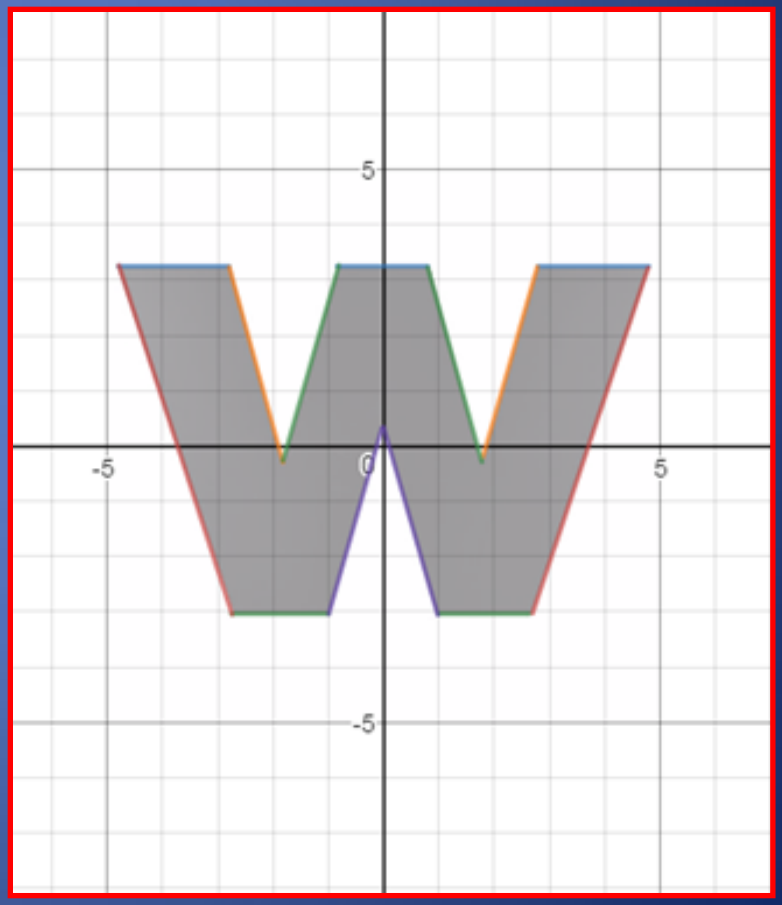
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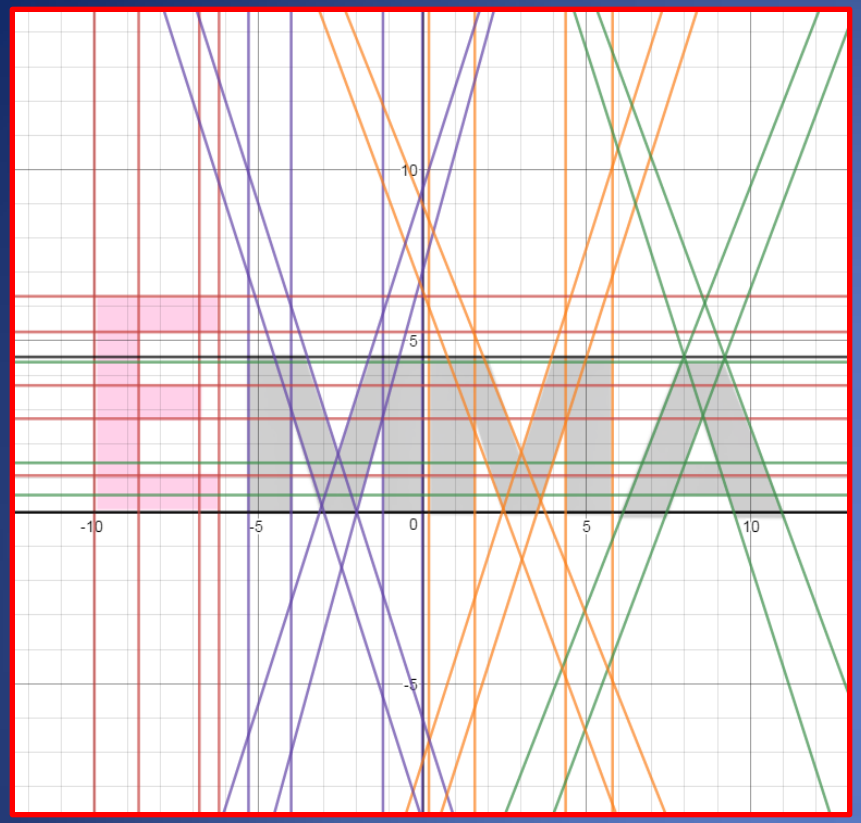
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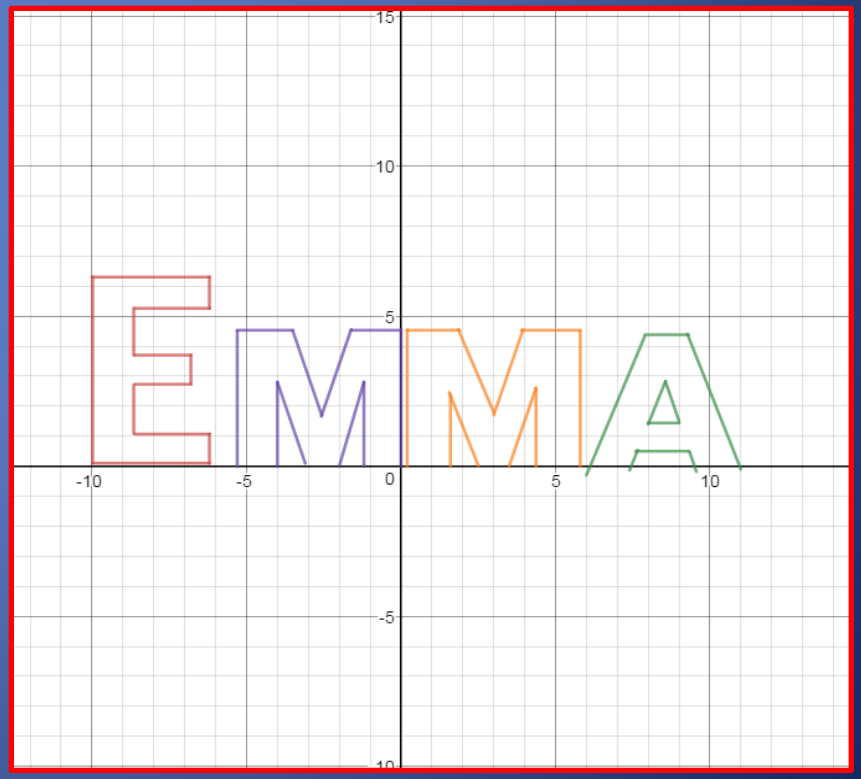
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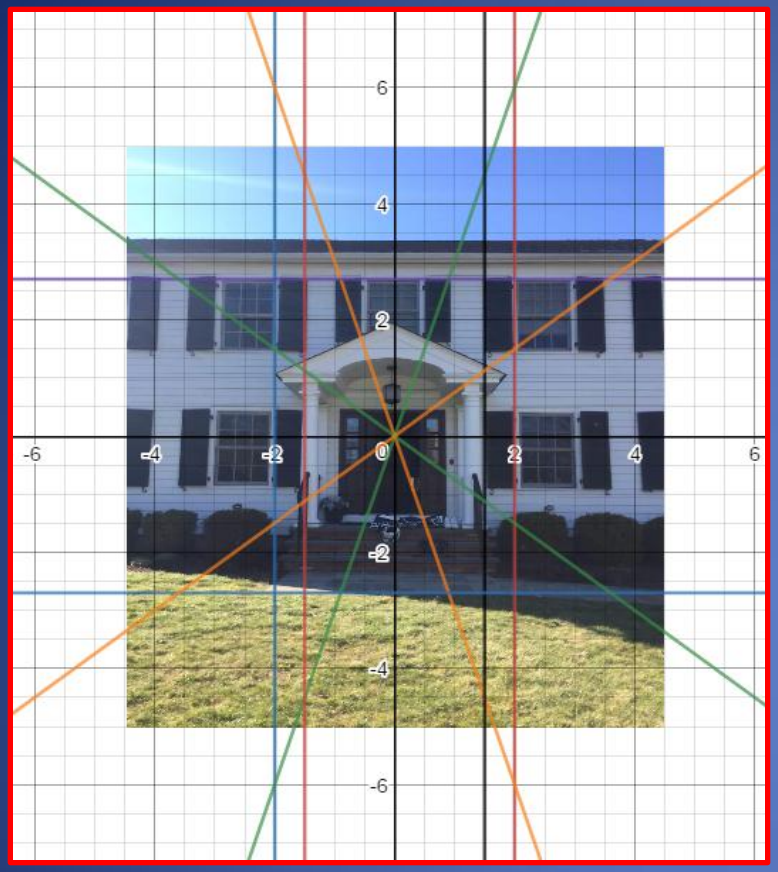
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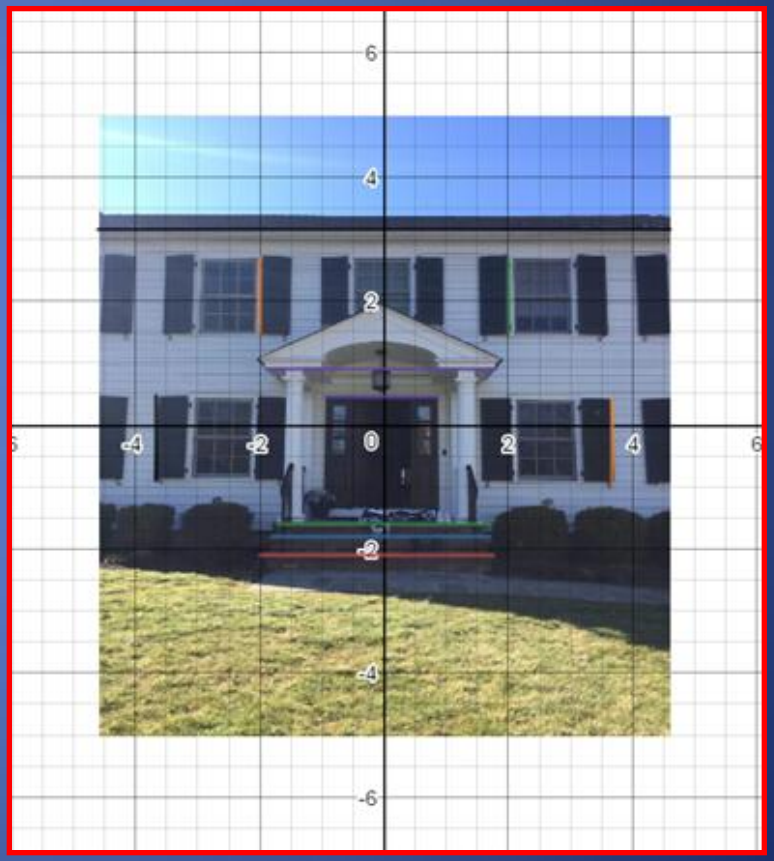
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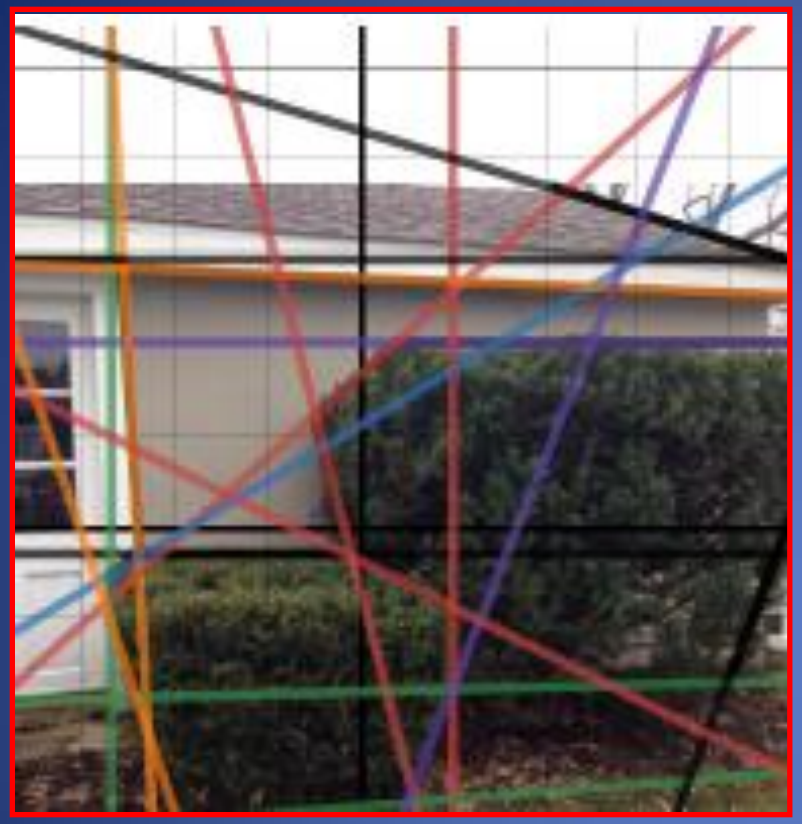

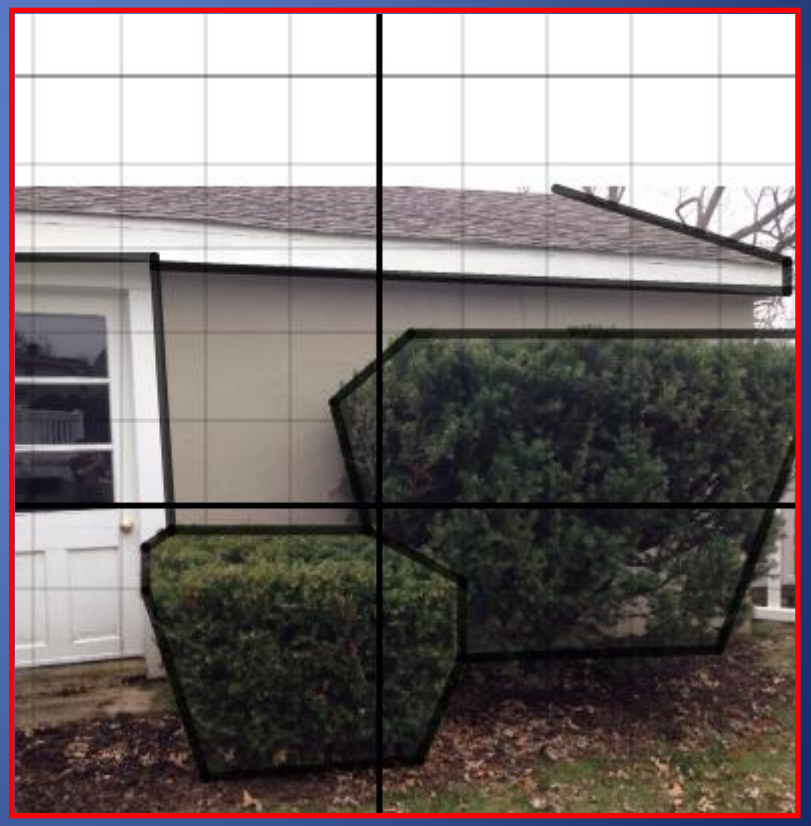

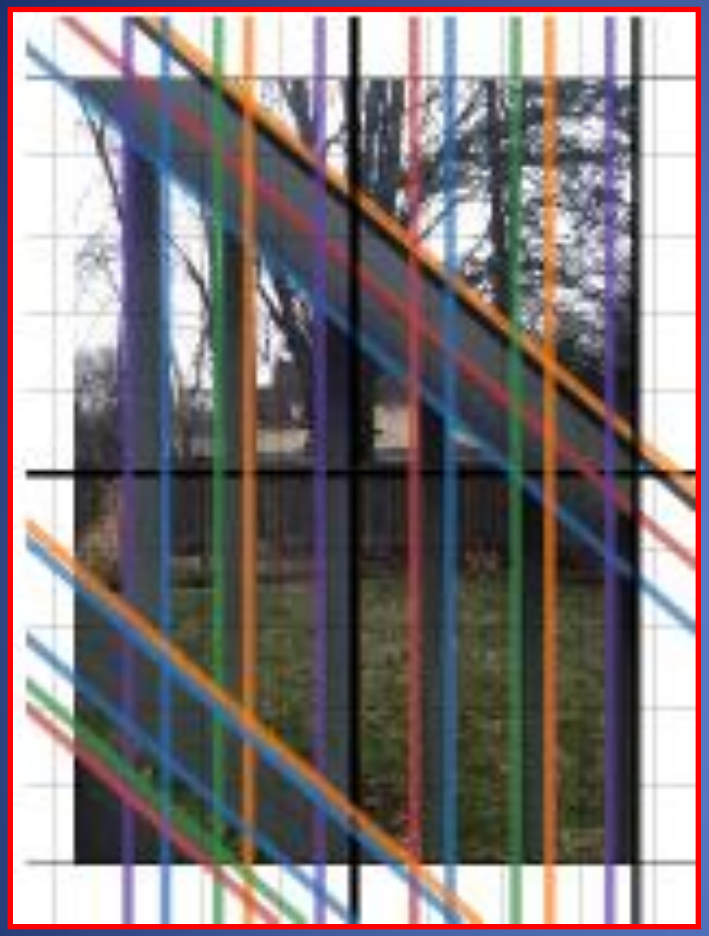

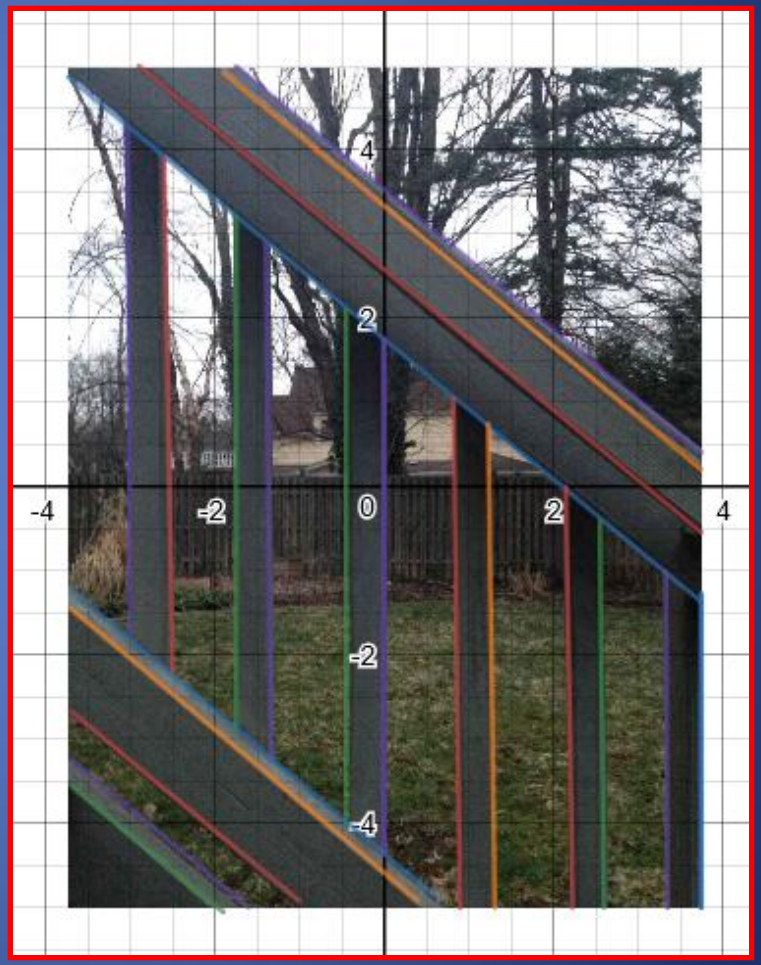
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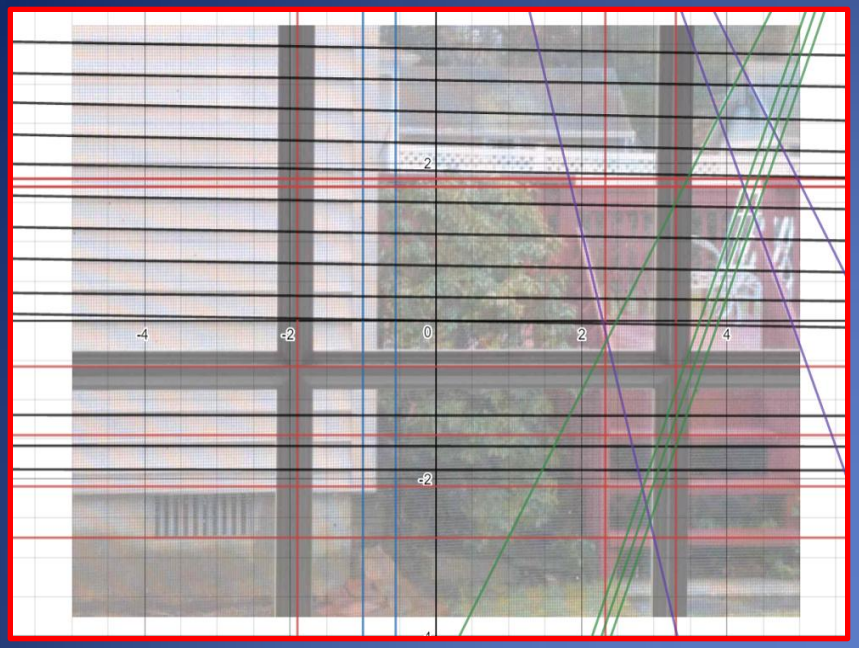
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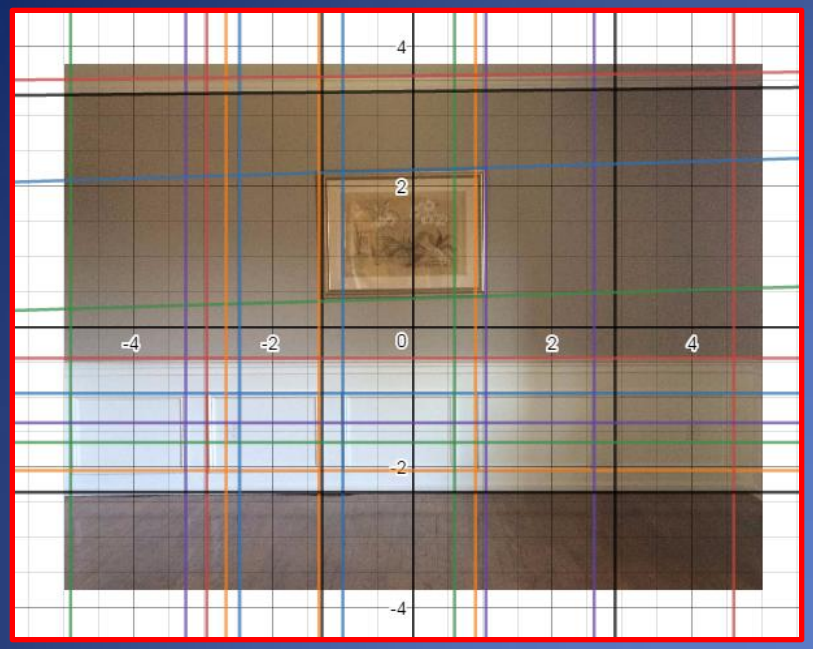
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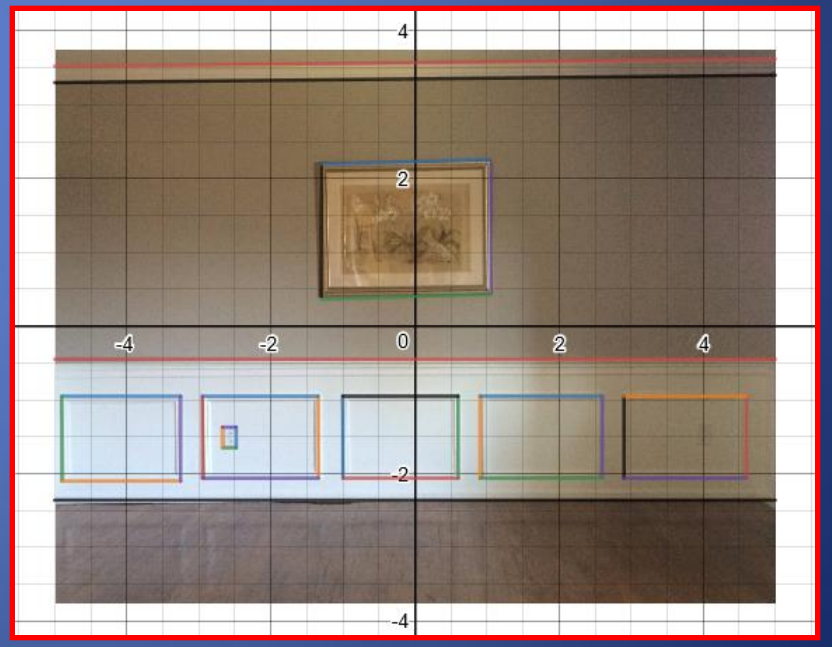
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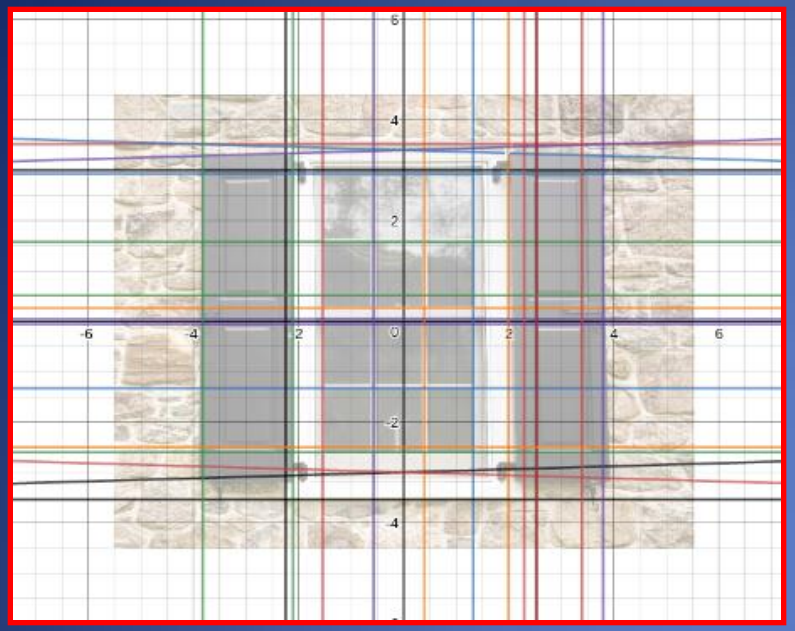
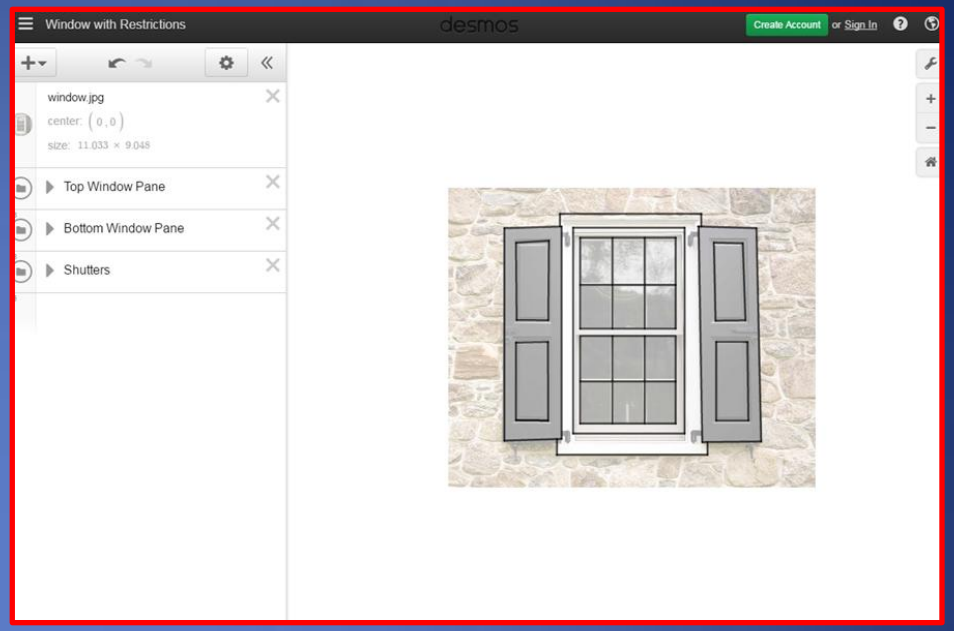
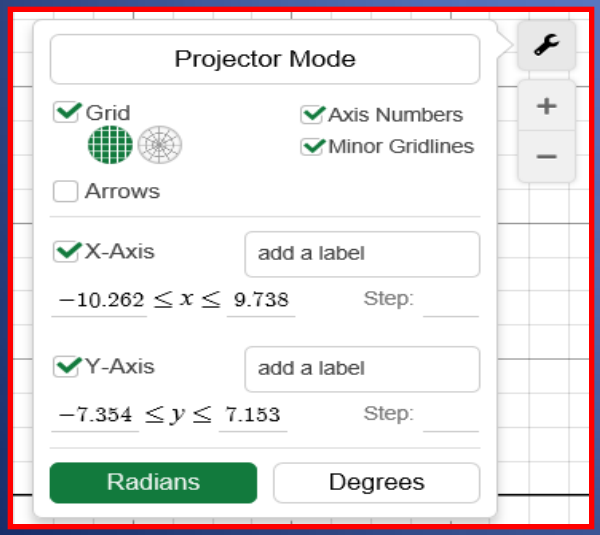
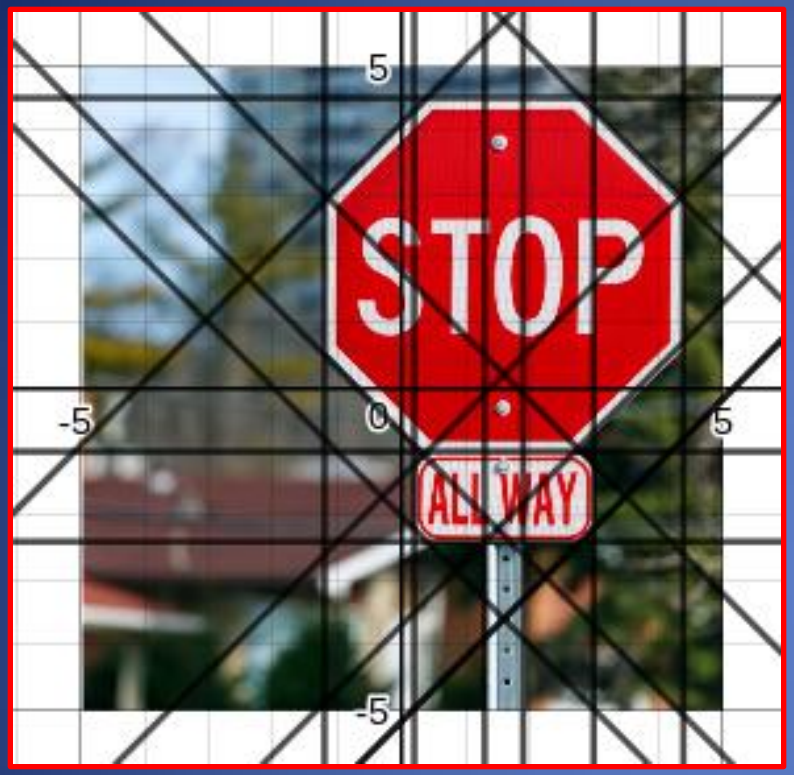






The icon with the wrench allows you to adjust the view of the final picture. This student eliminated the grid and axes so that only the window and shutters were visible.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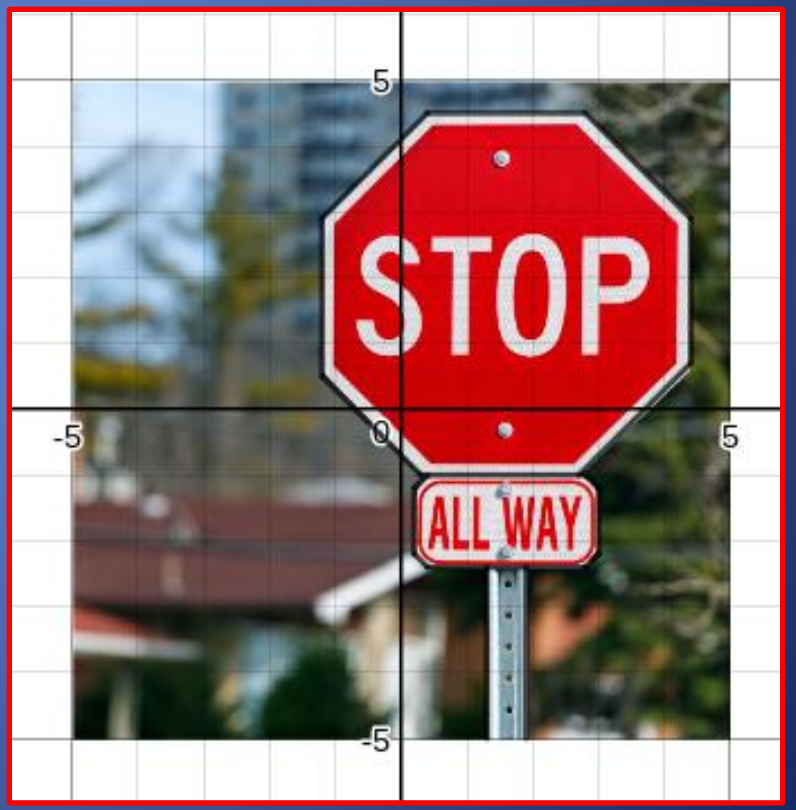
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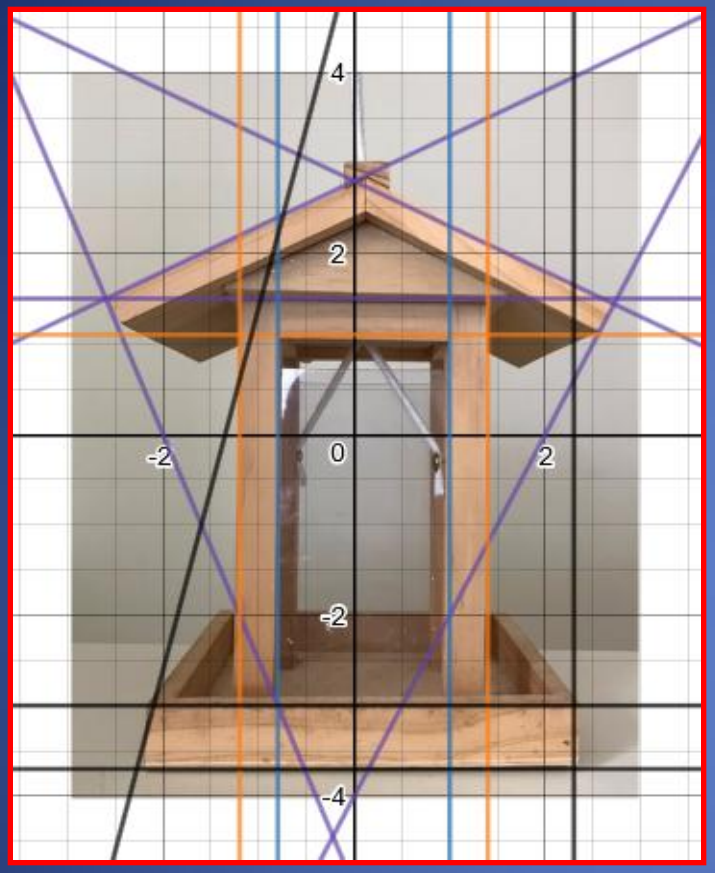
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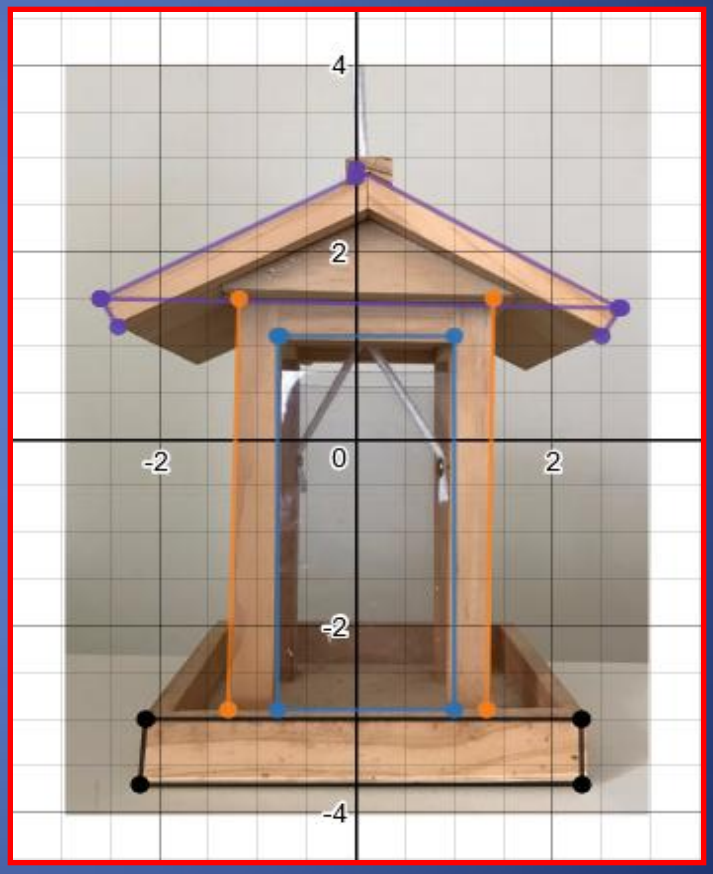
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Grading Rubric: consider the following attributes:

*Original photograph or drawing

*The photograph has vertical and horizontal lines, and lines with positive and negative slopes

*There are at least 10 – 12 lines set up with the equation $y = mx + b$ and/or using a table and line of best fit

*Student does the unrestricted and the restricted views of the photograph

*Level of difficulty for the equations

*Use of folders

Thank you for coming to this presentation!

If you would like a copy of the slide show, please send an email to:

Stephanie Cooperman: **Shc283@att.net**

or

Neil Cooperman: **Ncoop@att.net**