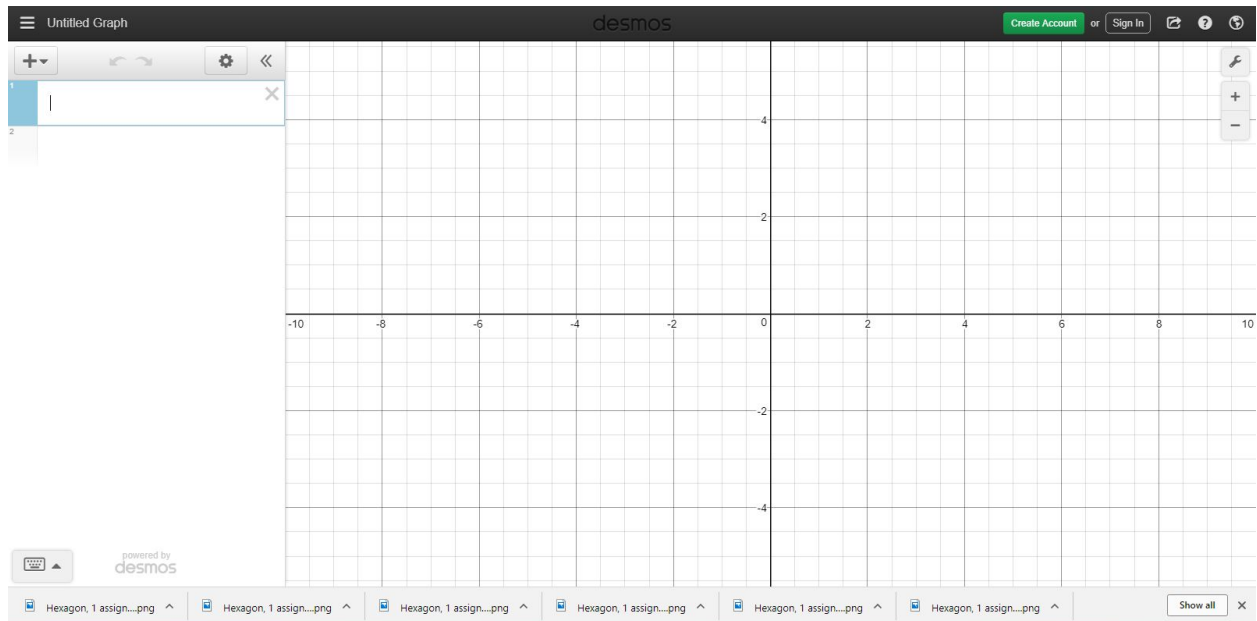



## Desmos Activity

Desmos is a free website with many capabilities. There is a simple four function calculator, a graphing calculator and soon to be a geometry function. Teachers and their students can create free accounts on Desmos. With these accounts teachers can save their graphs and create online activities for their students to complete. Student answers are submitted electronically and can be viewed by the teacher. This activity will focus on the capabilities of the graphing calculator.

Go to [desmos.com](https://desmos.com) and click on Start Graphing. A blank coordinate plane should appear.



### **Graph Settings:**

- To change graph settings go to the wrench icon in the upper right hand corner. 
- A box will appear that allows you to change the settings of the graph. Test each option to see how the graph is affected.
- The graph can either be a regular coordinate plane, or be a graph of the unit circle. We will keep it as a coordinate plane.
- You can change the appearance of the grid to be in projector mode, which will darken the grid lines.
- You can decide if you would like the axis numbers and minor grid lines to show. We will leave both of these boxes checked.
- You can decide if arrows will appear at the ends of the x and y axis.

- You can change the restrictions of the x and y axes. We will change the x axis to  $-5 \leq x \leq 15$  and the y axis to  $-2 \leq y \leq 20$ .
- If we wanted to we could label the x and y axes, but we do not have any data yet, so we will leave this space blank.
- To make the grid spaces 1 unit, we will change the step to 1.
- We will leave the graph in radians.

To leave graph settings click on the graph again.

### **Using Tables:**

- To insert a table go to the plus sign in the top left corner and click on the drop down menu. Select table.
- Copy the following data into the table.

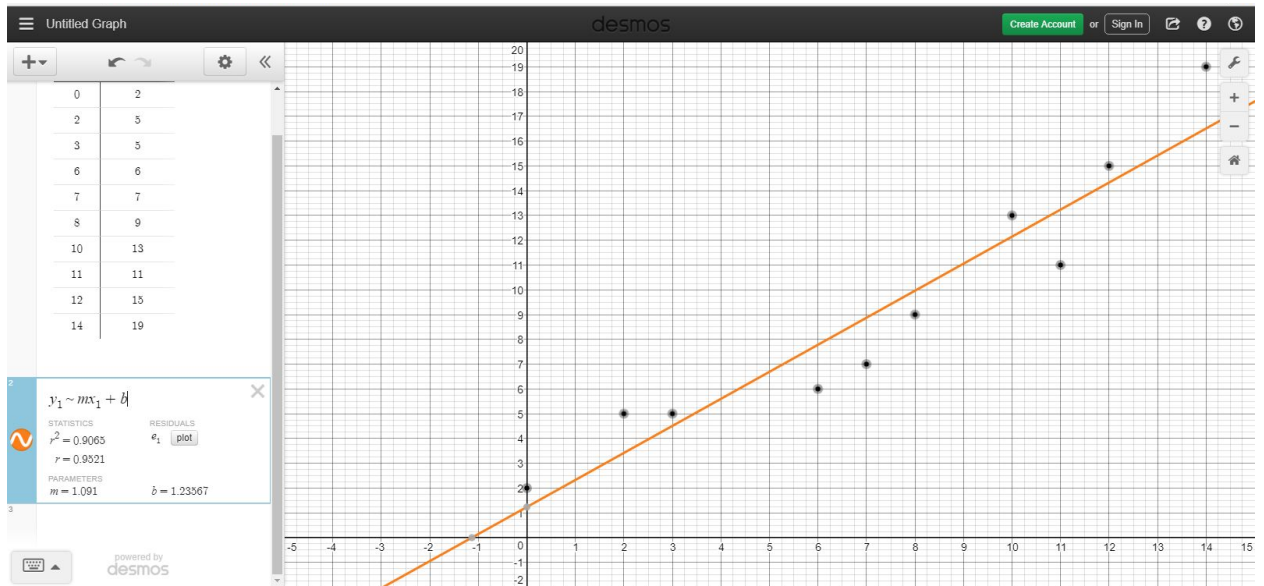


| x  | y  |
|----|----|
| 0  | 2  |
| 2  | 5  |
| 3  | 5  |
| 6  | 6  |
| 7  | 7  |
| 8  | 9  |
| 10 | 13 |
| 11 | 11 |
| 12 | 15 |
| 14 | 19 |

- To change the color of the points, connect the points, or drag the points around the graph click and hold the black circle next to the y in the top row.
- We will leave the points unconnected.

## Regressions:

- To find a linear regression, we will write the equation  $y_1 \sim mx_1 + b$  in the box below the chart. To type  $y_1$  and  $x_1$ , type y1 and x1. To add the  $\sim$  symbol go to the keyboard at the bottom of the screen and click on ABC. The  $\sim$  is an option on this keyboard.
- When the equation has been typed in correctly, the values for  $r$ ,  $r^2$ ,  $m$ , and  $b$  will appear. The line of best fit will be shown on the graph.



- If you want to try out different types of functions, such as quadratic or exponential, the type of equation after the  $\sim$  sign can be changed.

## Converting Functions to a Table:

- To get a list of coordinates from a given function, we will first need to start with a function.
- First Get rid of the points on the graph and the line of best fit. To do this either click the x next to the table and the equation or go to the three white lines in the top left hand corner and click new blank graph (if you choose this option the settings you changed will go back to the default settings).
- Next enter the equation  $y = x^2 + 2x + 1$ . The graph of this equation should be on the coordinate plane.
- To see a table that reflects the values of this equation go to the gear button at the top left side of the screen. This is the edit list button.
- Two new options will appear. The first is to convert the equation to a chart. The second is to duplicate the equation. We will convert the equation to a chart.

- Desmos will fill five coordinates into the chart from  $x=-2$  to  $x=2$ . If you want more values, you can fill in an  $x$  value into the chart, and the corresponding  $y$  value will be added.

### Using Sliders:

- Next we will graph the equation  $y=mx+b$ . Again clear the graph.
- Type in the equation  $y=mx+b$ .
- Once this equation is entered an option to add sliders to the variables  $m$  and  $b$  is given. Click all.
- Once you click all, a line will appear on the grid as well as two sliders. One controls the  $m$  value and one controls the  $b$  value. The default settings allow you to change the value of each variable from  $-10$  to  $10$ . To change the range of numbers you can use click on either the upper or lower bound. You can now change the value of the bounds and the value of the step between each number on the slider. Change it range and step value.



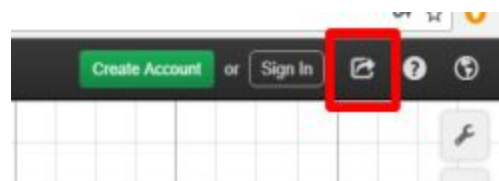
- Explore what types of lines can be made when changing the values of each slider.

### Setting Intervals:

- Again clear the graph using whatever method you find easier.
- Type in the equation  $y = x^2 + 5$ . Make sure your grid is in the correct settings so you can see the graph. If you do not want to go into settings, you can also click the graph and drag until the function is in view. You can use the plus and minus signs at the top right hand corner of the page to zoom in and out.
- To set an interval on this function type so only the  $y$  values from  $5$  to  $10$  are showing type  $\{5 < y < 10\}$  next to the equation. This will change the range. The same can be done for  $x$  values.

### To Save and Share a Graph:

- In order to save a graph on Desmos, you must have an account. Making an account is free and only requires an email address.
- Once you are logged on you can save a graph by using the green save button in the top left hand corner.
- To share a graph, go to the arrow in the top right corner and click share graph. This will generate a link that can be used to share the graph with others.



**Accessing Premade Activities:**

- To find a premade activity go back to [desmos.com](https://www.desmos.com)
- Click on Classroom Activities.
- Use the search bar to find a classroom activity relating to the topic you are working on in class.

Exercises:

Log in to [desmos.com](https://www.desmos.com) so you can save your work. To turn in assignments send the link to each graph.

1. From the activities that have already been created, find an activity that can be used in the classroom if you were teaching students about transforming a graph.
2. Create a slider that shows how the different coefficients of a quadratic equation effect how the graph appears. Be sure to change the interval of each variable from their default settings to best show how the changing values affect the graph. Save this graph as "Quadratic Equations."
3. Enter the following data as a chart. Change the settings of the graph so all points fit. Label the x and y axes. Then find the line of best fit and predict the sales in 2020 based on this line. Save this graph.

| Year | Sales   |
|------|---------|
| 2010 | \$1,058 |
| 2011 | \$1,210 |
| 2012 | \$1,405 |
| 2013 | \$1,780 |
| 2014 | \$1,916 |
| 2015 | \$2,025 |
| 2016 | \$2,356 |
| 2017 | \$2,680 |

Email all links to graphs and activities to the professor. Label each link with the exercise number.