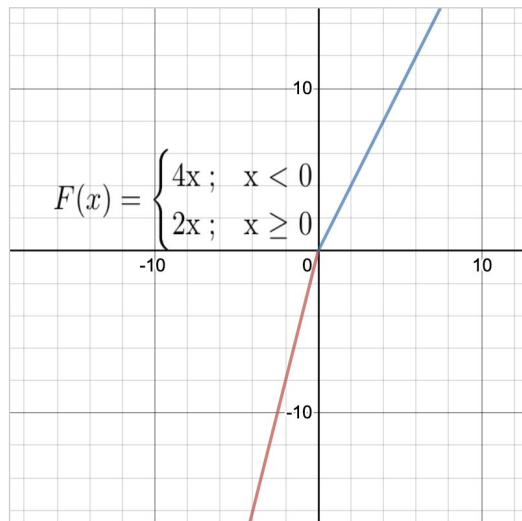


Desmos Lesson: Graphing Piecewise Functions

A _____ is a function that is made up of _____ . It _____ so it must pass the vertical line test.



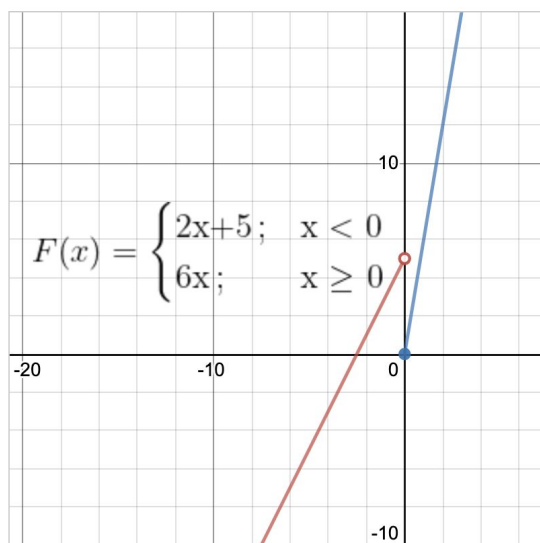
On this graph the first function (red) is $f(x) = 4x$ when $x < 0$

and the second function (blue) is $f(x) = 2x$ when $x \geq 0$.

This is how we will write piecewise functions when we write them on paper.

$$F(x) = \begin{cases} 4x; & x < 0 \\ 2x; & x \geq 0 \end{cases}$$

On Desmos we need to put them on separate lines.



On this graph the first function (red) is $f(x) = 2x + 5$ when $x < 0$ the second function (blue) is $f(x) = 6x$ when $x \geq 0$.

Notice the "open circle" on the red line. That is because when $x = 0$ that point is not included in the domain of the red function ($x < 0$).

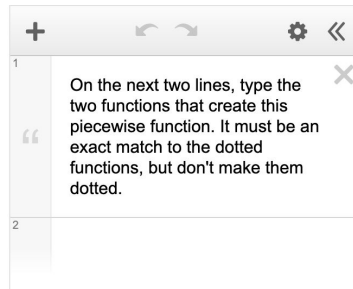
There is a "closed circle" on the blue line. $x = 0$ is included in the blue function because zero is included in $x \geq 0$.

In a piecewise function it is important to know what function is used for all x-values.

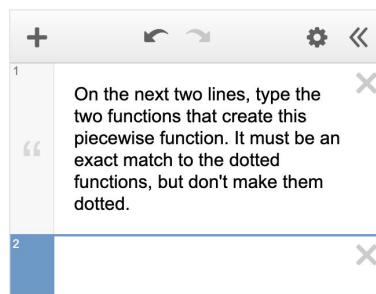
Now let's practice graphing our own piecewise functions!

Example 1:

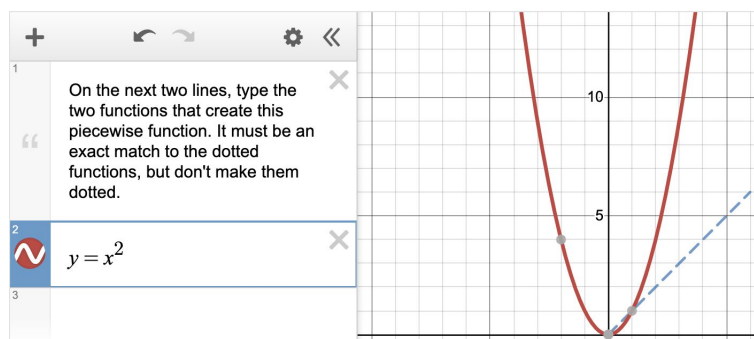
On the next two lines, type the two functions that create this piecewise function. It must be an exact match to the dotted functions, but don't make them dotted.



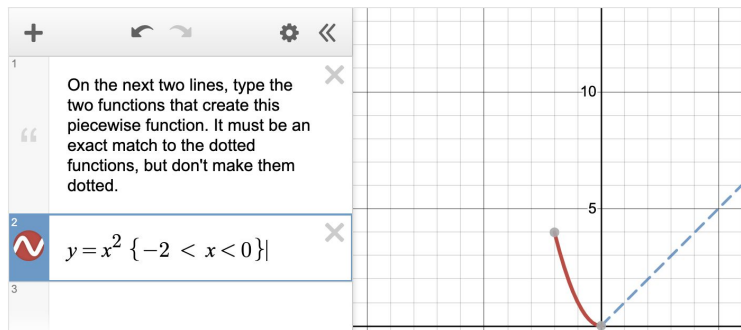
Step 1: Click on the number 2 underneath the directions so that the box is highlighted blue.



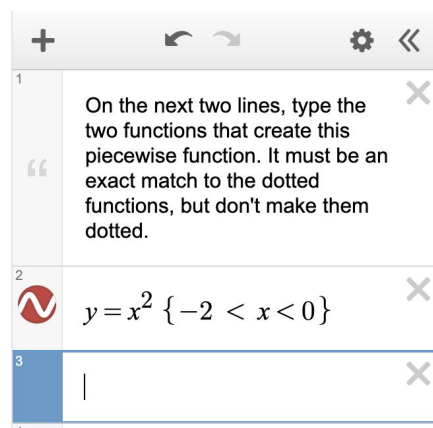
Step 2: Type in the equation of one of the functions on this line. Let's start with the red function. It should be in the format of $y = x^2$.



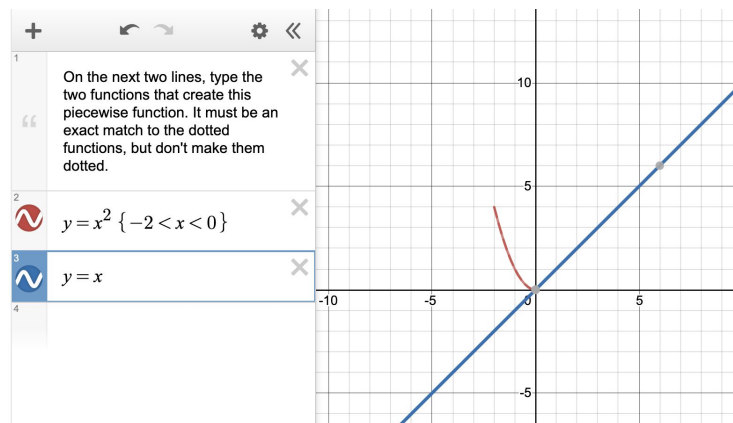
Step 3: Now we have to set the restrictions so that our function matches the red dotted function exactly. Next to where we typed $y = x^2$, we have to type $\{-2 < x < 0\}$ to restrict x to just these values. (Make sure to click the right arrow after you type the exponent before you type the bracket).



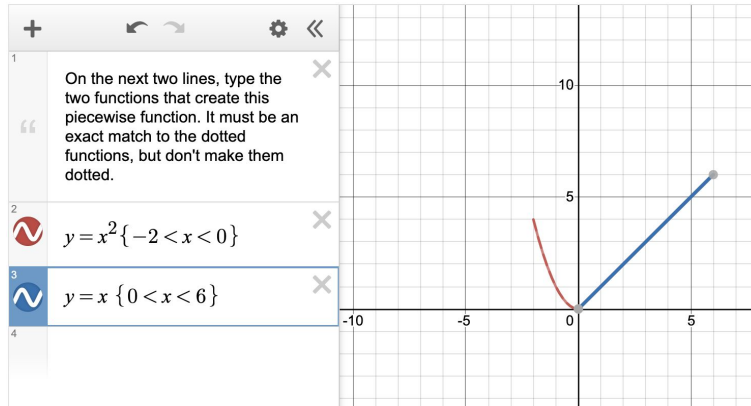
Step 4: Repeat the process with the next function. First click next to the 3 to make the box highlight blue.



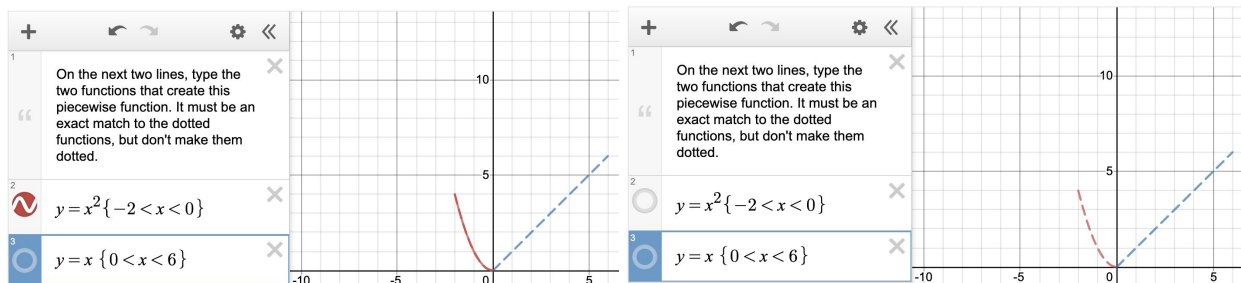
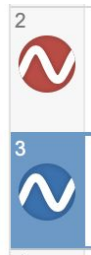
Step 5: Type in the equation for the function in blue. It should be in the format of $y = x$.



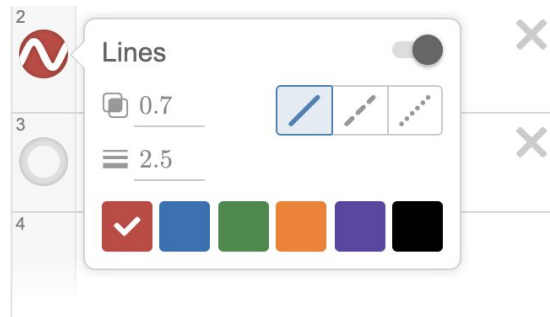
Step 6: Now set the restrictions so that our function matches the dotted function exactly. Next to where we typed $y = x$ type $\{0 < x < 6\}$ to restrict x to just these values.



Step 7: Notice next to where we typed the functions there are a red and a blue circle. If you click there you can make the solid line you wrote disappear so that you can check that it lines up exactly with the dotted line.

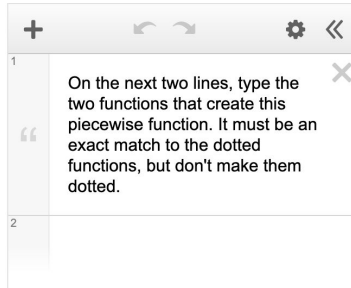


Step 8: If you click and hold down on one of the circles a menu will appear that lets you change the color, thickness and opacity of the line as well as choose if you want it to be solid, dashed or dotted.

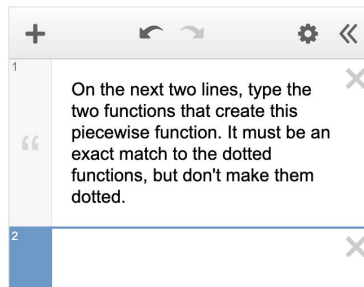


Example 2:

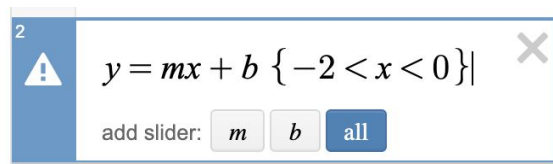
For this example we are going to practice using sliders! On the next two lines, type the two functions that create this piecewise function. It must be an exact match to the dotted functions, but don't make them dotted.



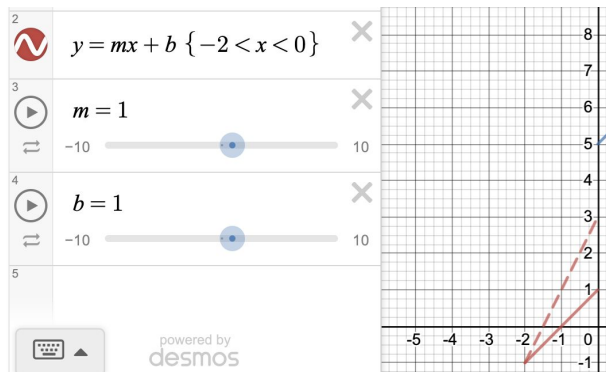
Step 1: Click on the number 2 underneath the directions so that the box is highlighted blue.



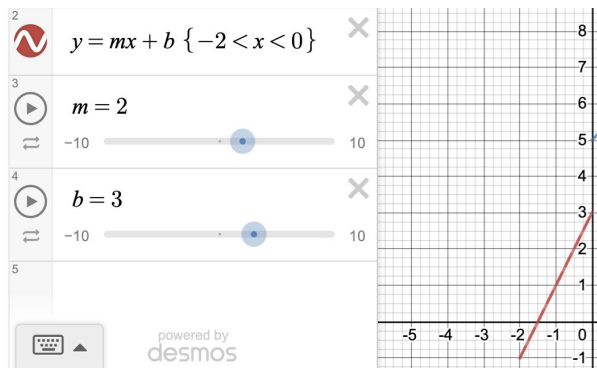
Step 2: Let's start with the red function. This is a line so start by typing the equation of a line $y = mx + b$ and $\{-2 < x < 0\}$ to restrict x to just these values.



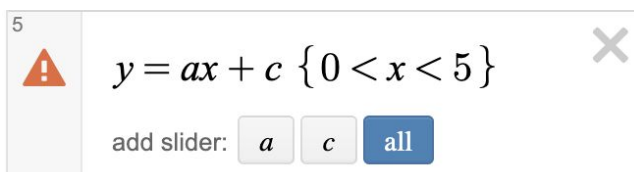
Step 3: Now click on the blue "all" button to create a slider for m and a slider for b .



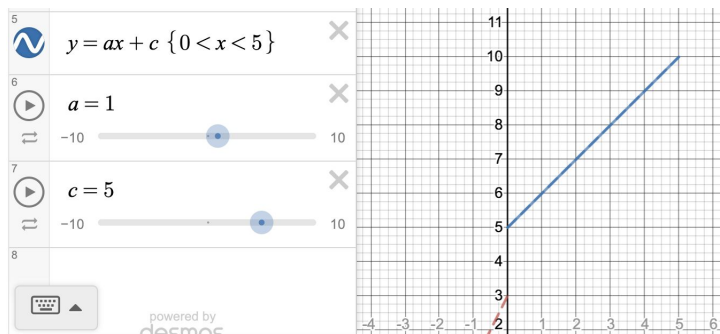
Step 4: Now for each slider drag the blue circle until the solid red line matches the dotted red line.



Step 5: We are also going to create a slider for the blue function which is also a line, however, we can't use $y = mx + b$ since we already have a slider for m and b for the red function. You can choose any other letters for the variables, let's choose $y = ax + c$ and type $\{0 < x < 5\}$ to restrict x to just these values.

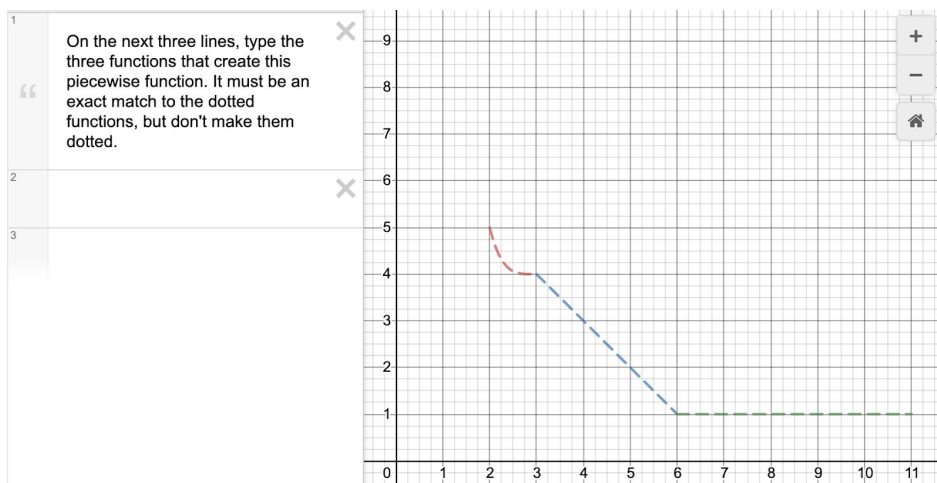


Step 6: Now click the blue "all" button to create a slider for a and a slider for c. Move the blue circles until the solid blue function lines up with the dotted blue function.

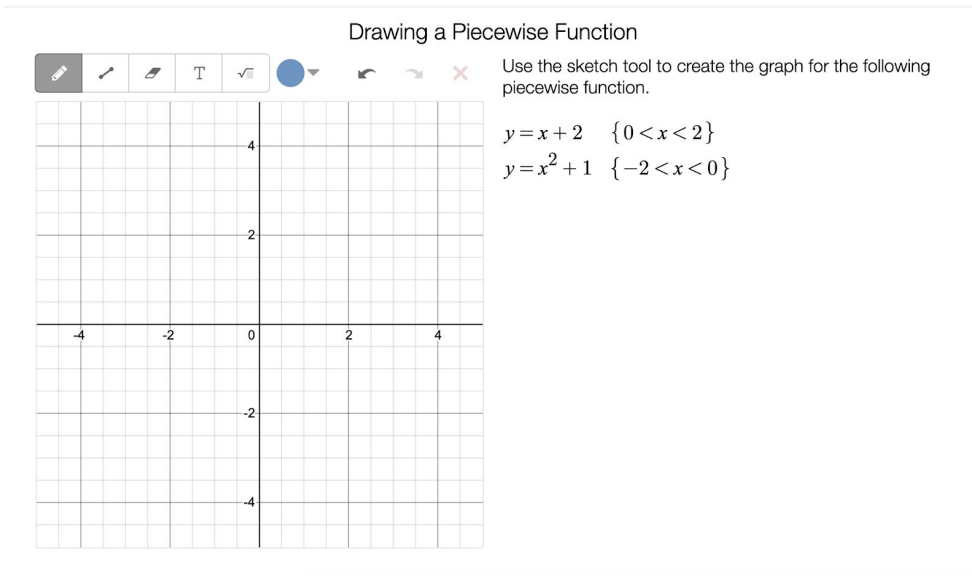


Challenge problems:

1.



2.



Citations

This lesson has been edited and adapted from the following lesson:

<https://teacher.desmos.com/activitybuilder/custom/5b0232029e40e60ac0c15806>