USING DESMOS

Desmos is a free online interactive graphing calculator program that can be used to carry out many of the same calculations and operations that can be performed with a graphing calculator, and more: graph a function (including piecewise-defined functions), make a table of values for a function, fit a line to a data set, and make a dynamic graph with a slider. The web address for Desmos is

www.desmos.com

On the home page, you can explore on your own by choosing from many examples.

Below, examples of the following are given.

Example 1: Graph a Function

Example 2: Graph a Piecewise-defined Function

Example 3: Make a Table of Values for a Function Formula

Example 4: Create an Interactive Graph with a Slider
Example 1: GRAPH A FUNCTION

Graph the quadratic function

\[ y = 12 + 4x - x^2 \]

in the graphing window \([-4, 8]\) by \([-2, 16]\).

Function formulas are entered on the far left-side of the Desmos window in the boxes numbered 1, 2, etc. For the given function, enter the following into box 1.

\[ y = 12+4x-x^2 \]

On the screen, you will see the following in box 1.

(Note: \(x^2\) displays as \(x^2\).) The graphing window may be changed by clicking on the “wrench icon” in the far upper right hand side of the screen.

Just click on the numbers shown for the X-axis or Y-axis to change their values. Then click outside of the box to close the graph settings window.

The resulting graph is shown in the following figure.
Example 2: GRAPH A PIECEWISE-DEFINED FUNCTION

Graph the piecewise-defined function.

\[ f(x) = \begin{cases} 
  x^2 & \text{if } x \leq 1 \\
  1 - x & \text{if } x > 1 
\end{cases} \]

The template for a piecewise-defined function with three rules is as follows.

\[ y = \{ \text{first domain: first rule, second domain: second rule, third domain: third rule } \} \]

For the given function, enter the following into box 1.

\[ y = \{1 \leq x: x^2, x > 1: 1-x\} \]

On the screen, you will see the following in box 1.
(Note: 1\leq x displays as x\leq1 and \text{x}^2 displays as x^2.)

The graphing window may be changed by clicking on the “wrench icon” in the far upper right hand side of the screen.

Just click on the numbers shown for the X-axis or Y-axis to change their values.

You can also zoom-in or zoom-out on the graph by clicking on the “2-sided line icon” in the far upper right hand side of the screen.

The following figure shows the resulting graph in the window [-5, 5] by [-10, 10].
Example 3: Make a Table of Values for a Function Formula

Make a table of values for

\[ y = x^2 \]

for the values \( x = 1, 1.5, 2, 2.5 \) and 3.

First, click on the + button (Add Item) on the left side of the Desmos window and a drop down menu will appear.

Select the table option from this menu – the following figure will appear in box 1.

Replace \( x_1 \) by \( x \) by just highlighting \( x_1 \) with the mouse cursor and typing over it. Similarly, replace “\( y_1 \)” by “\( x^2 \)”, and change the \( x \)-values as needed. The following figure will appear on the screen.

Observe that the polka-dot circle next to “\( x^2 \)” is a toggle switch for the matching scatter plot in the graphing window.
Example 4: Create an Interactive Graph with a Slider

Create an interactive graph for

\[ y = ax \]

for the values \( a = -5, -4, \ldots, 4, 5 \) in the graphing window \([-10,10]\) by \([-10,10]\).

First, enter the function formula in box 1.

Next, click on the button labeled with “\( a \)” in box 1. The following appears in box 2.

You can change the values of \( a \) on the slider by just clicking on the number -10 on the slider.

For this example, the values of \( a \) range from -5 to 5 with a step of 1 since the x-values constantly increase by 1. Then click outside of the box to fix these values.

Finally, you just click on the forward play button to start the animation – don’t forget about the graphing window if it needs adjusting. To stop the animation, click on the stop button.