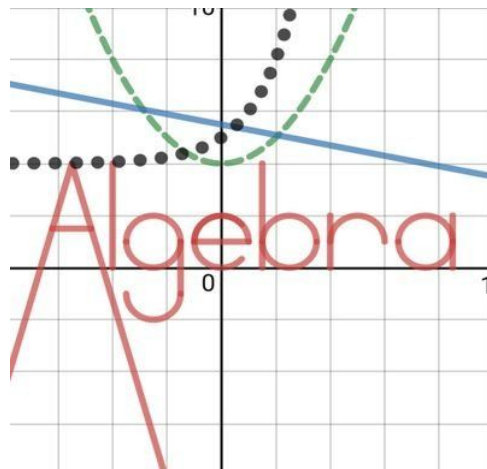


Desmos 101- Algebra 1

Incorporating Desmos Into Instruction



Objectives & Agenda

OBJECTIVES:

1. To increase teacher understanding and knowledge of Desmos App.
2. To use Interactive tasks to highlight how Desmos can be utilized to support teacher instruction and student assessment
3. To use Interactive tasks to highlight how Desmos can be used to support student learning and exploration

AGENDA:

1. Desmos Overview
2. Interactive Task 1: Linear Equations
3. Interactive Task 2: Functions
4. Interactive Task 3: Desmos & Key Features
5. Curriculum Connections
6. Questions/Next Steps/Contacts

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About

Partnerships

Classroom Activities

We're Hiring!

Explore math with Desmos.

Graph functions, plot data, evaluate equations, explore transformations, and much more – for free!

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Four Function and Scientific

Check out the newest additions to the Desmos calculator family.

Four Function

Scientific



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Find the best digital activities for your math class — or build your own.

Classroom Activities



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Level up your Desmos skills with videos, challenges, and more.

Learn More

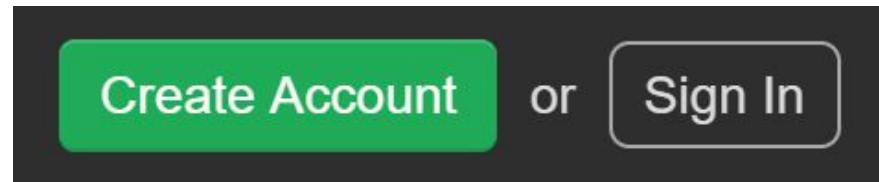
Keeping Track

Desmos allows you to create, save, and share your creations.




- Prep for Instruction
- Classroom Activities
- Answer Keys for graphical representations

Accessible by:


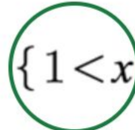
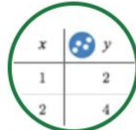

- Creating an account OR
- Sign in with a google-based email

A white modal form titled "Sign In" with a close button (X) in the top right corner. It features a "Sign in with Google" button with the Google logo. Below this is a separator line with the text "Or sign in with Desmos". There are input fields for "Email" and "Password". A link "Forgot your password?" is located to the right of the password field. At the bottom, there is a link "Create an Account" and a green "Sign In" button. A yellow note box at the bottom states: "Note: Desmos uses cookies to enable persistence when you are signed in. If you do not wish to use cookies, please use Desmos without logging in. [Learn More.](#)"

Desmos Learning Tools






Kate ▾   

Tours




Sliders Tables Restrictions Regressions

Resources

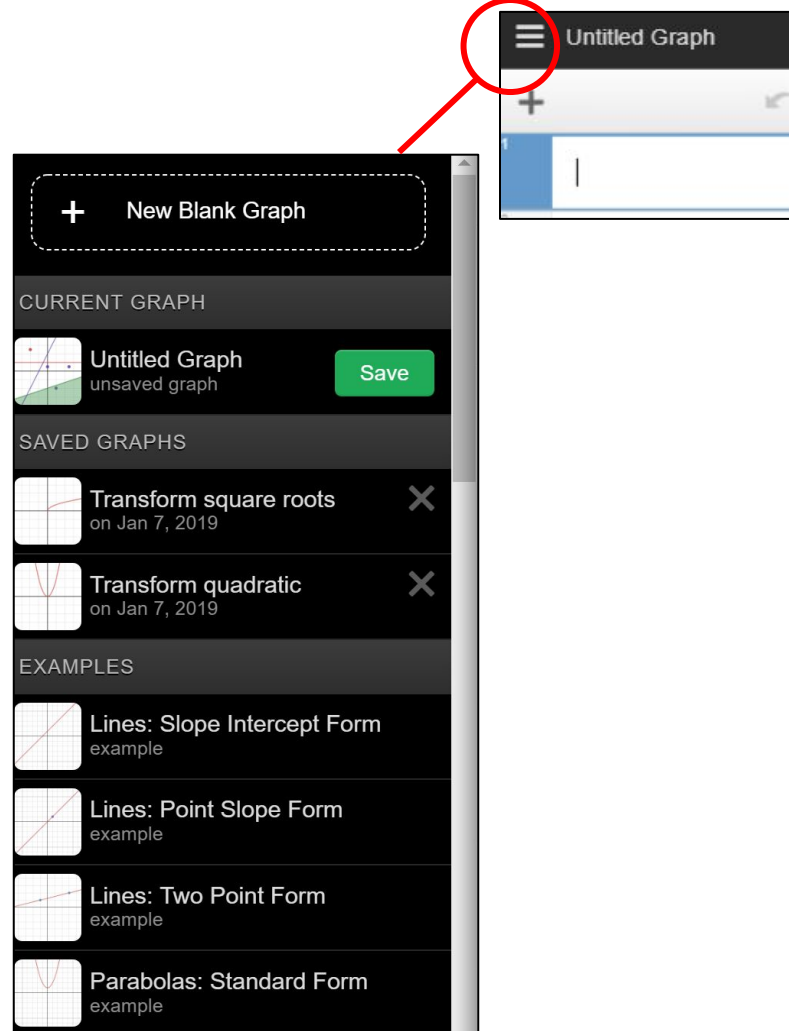
-  Getting Started
-  Video Tutorials
-  Desmos User Guide
-  Help Center
-  Keyboard Shortcuts

Feedback

Send us your question or suggestion... 

Ready-To-Use Material

- Sample Slider examples provided by Desmos
 - Forms of Linear Equations
 - Forms of Quadratic Equations
- Teacher Lesson Planning:
 - Create slider set ups in advance
 - Modify slider samples to make them your own
 - Graph items ahead of time to use within instruction in preparation for guided practice, independent practice, or informal assessments



Teacher Collaboration

- Screen Capture
- Share a link
- Print
- Export
- Embed



Share your graph

Share this link:

<https://www.desmos.com/calculator/h59c3>

Copy



Print



Export Image



Embed

Entering Characters

Keyboard can be used for:

- All basic mathematical characters
- Typing out trig functions, statistical functions, logarithmic functions, etc.

Special characters that cannot be entered with the keyboard will require the Desmos multi-function keyboard

- Absolute value, square root, subscripts, inequality symbols, Greek symbols, etc.

Trig	Stats	Dist	Misc
sin	\sin^{-1}	sinh	
cos	\cos^{-1}	cosh	
tan	\tan^{-1}	tanh	
csc	\csc^{-1}	csch	
sec	\sec^{-1}	sech	
cot	\cot^{-1}	coth	

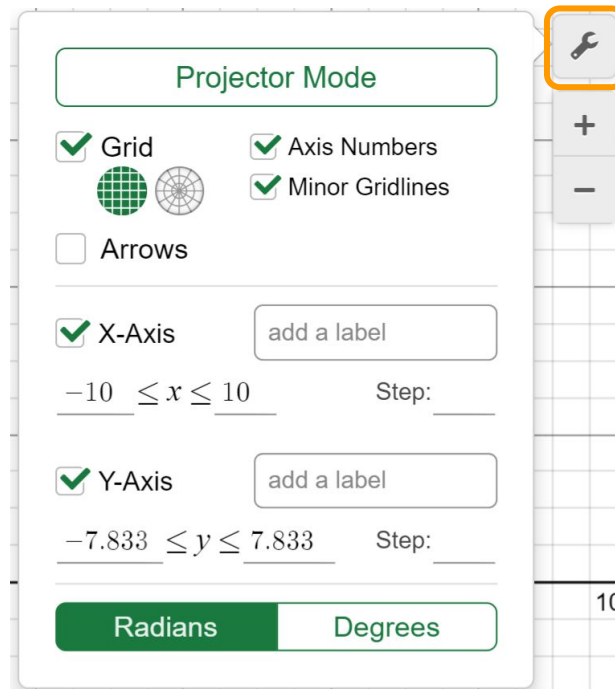


Adjusting Views



Full Screen Graph

Graph will Zoom In (+)
and Zoom Out (-)




- Graph modifications (restrict domains or ranges, add labels to axes, set scales);
- Similar to the “Mode” and “Windows” on a physical graphing calculator

ACTIVITY 1: Linear Equations


- 1) Graph (3, 4) and (-1, -8)
- 2) Create a linear equation slider ($y = mx + b$) and adjust **m** and **b** values to approximate the line that contains the points.
- 3) Record the equation of your approximated line in slope-intercept form.
- 4) Determine the line that contains the points **algebraically** in slope-intercept form.
- 5) Rewrite this equation in point-slope form and standard form.
- 6) Graph these three equations in Desmos and compare the graphs of all three equations.



ACTIVITY 1: Linear Equations (Extension)

- Determine if the following coordinates are solutions 
- (0, -5) (-10, -20) (5, 10) (20, 65)

- Confirm graphically using a table generator.

x_1	 $3x_1 - 5$
0	-5
10	25
5	10
20	55

- Confirm algebraically using substitution.

ACTIVITY 1: Linear Equations

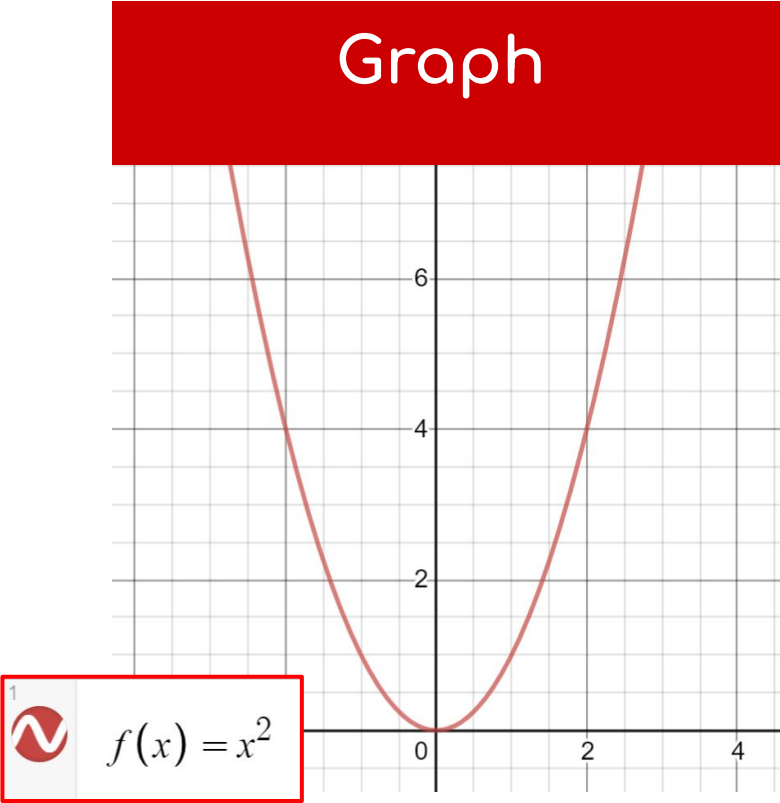
Skills

- Graph coordinates
- Create a linear equation slider
- Approximate a line connecting two coordinates
- Write equations of lines in different forms.
 - ◆ **A1: A-CED.A.2**
- Determine if coordinates are solutions to the linear equation
 - ◆ **A1: A-CED.A.3, A1: A-CED.D.10**

Vocabulary

Coordinate
Linear Equation
Solution
Slope
Intercept
Slope-Intercept Form
Point-Slope Form
Standard Form

Functions with Desmos



Evaluate


2

$f(4)$

$= 16$

Table of Values

3

x_1	 $f(x_1)$
-2	4
-1	1
0	0
1	1
2	4

ACTIVITY 2: Functions

- 1) Graph $f(x) = x^2$.
- 2) Use Desmos to evaluate the function at $x = 4, 9, 25$
- 3) Generate a table of values based on the function: $f(x) = 3x + 9$
- 4) Create a quadratic function slider for $f(x) = ax^2$ to adjust a .
 - Record observations to explain how adjusting values on the slider affect the graph.
 - Based on your observations, complete the following sentences:
 - When a changes from positive to negative, the graph _____.
 - As a increases from 1 to 10, the graph _____. This is a _____.
 - As a decreases from 10 to 1, the graph _____. This is a _____.

ACTIVITY 2: Functions

5) Create a quadratic function slider for $f(x) = (bx)^2$ to adjust **b**.

- a. Based on the graph that is created, what is the beginning value of **b** and the shape of your graph?
- b. Based on your observations, when **b** = 0, describe the graph that is created. Why?
- c. Based on your observation, complete the following sentences:
 - i. As **b** increases from 0 to 10, the graph _____.
 - ii. As **b** decreases from 10 to 0, the graph _____.
 - iii. As **b** increases from -10 to 0, the graph _____.
 - iv. As **b** decreases from 0 to -10 the graph _____.



ACTIVITY 2: Functions (Extension)

- Create a quadratic function slider for $f(x) = (x-h)^2$ and adjust **h** values to explore and make observations about how values affect the graph.
- Create a quadratic function slider for $f(x) = x^2 + k$ and adjust **k** values to explore and make observations about how values affect the graph.
- Create a quadratic function slider for $f(x) = (x-h)^2 + k$ and adjust **h** and **k** values simultaneously to explore and make observations about how values affect the graph.



ACTIVITY 2: Functions

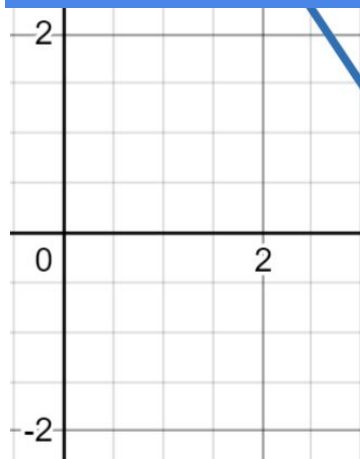
Skills

- Evaluate Functions
 - ◆ A1: F-IF.A.2
- Identify Domain & Range
 - ◆ A1: F-IF.B.5
- Identify Transformations of Functions
 - ◆ A1: F-BF.B.3

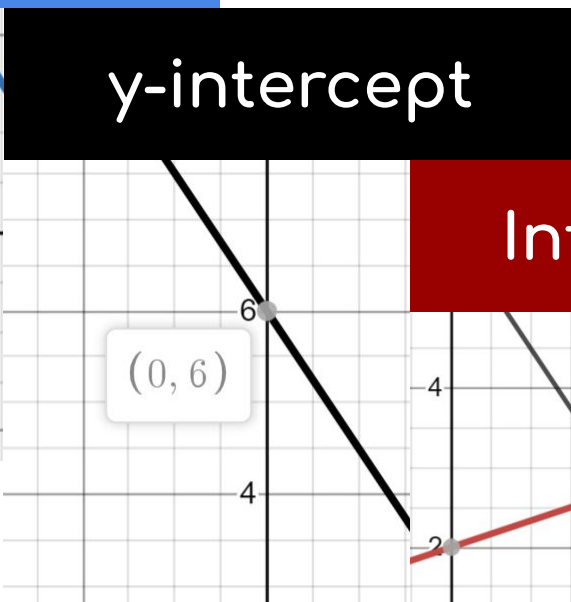
Vocabulary

Transformation
Translation
Reflection
Vertex
Parent function
Domain
Range

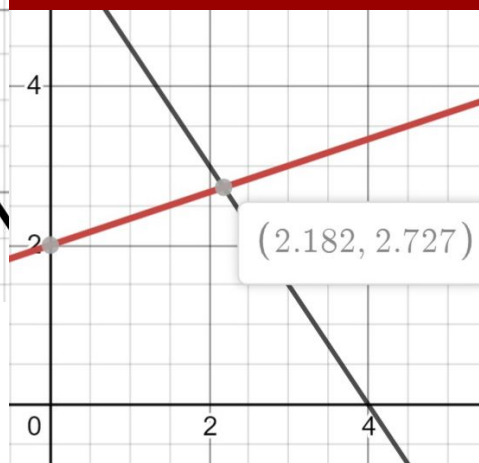
x-intercept



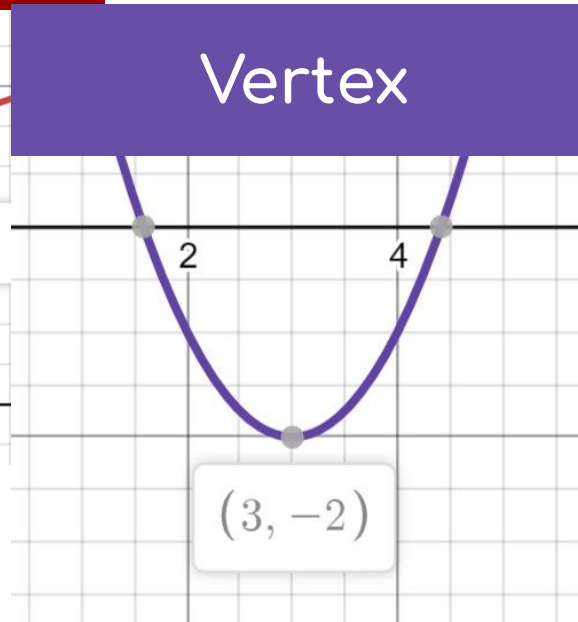
y-intercept



Intersection



Vertex



ACTIVITY 3: Key Features with Desmos

→ Graph linear system

What is the solution to the system of equations?

$$\begin{cases} -5 = x - 3y \\ 11 = -3x + 7y \end{cases}$$

- ★ Write the solution as an ordered pair (x, y) and explain how graphing the system helps you to determine the solution to the system
- ★ Prove the solution of the graph by solving the system of equations using the substitution method.
- ★ Prove the solution of the graph by solving the system of equations using the elimination method.

ACTIVITY 3: Key Features with Desmos

→ Graph linear system (Extension)

Consider the system of equations.

$$\begin{cases} -2x + 6y = -8 \\ cx + 3y = -4 \end{cases}$$

- ★ Using the slider tool, determine a value of **c** that will produce a system that:
 - Has ***infinite solutions*** and provide an explanation to support your value
 - Has ***one solution*** and provide an explanation to support your value
 - Has ***no solution*** and provide an explanation to support your value.

ACTIVITY 3: Key Features with Desmos

→ Graph a quadratic model to answer real-world scenarios.

A ball was thrown upward into the air. The height, in feet, of the ball above the ground t seconds after being thrown can be determined by the expression $-16t^2 + 40t + 3$.

★ Does this graph have a maximum or minimum?

- Where is it located?
- What does it represent in the context of the problem

★ How long does it take the ball to reach the ground?



★ Use the graph to rewrite the expression in vertex form. Prove that your expression is equivalent to $-16t^2 + 40t + 3$.

ACTIVITY 3: Key Features with Desmos (Extension)

- Graph a system with equations of different degrees to allow students to continue to explore key features of each equation and each system. Focusing on solutions and number of solutions (none, one, two, or infinite) based on the equations within the system:
 - ◆ Linear and/or a quadratic, exponential, absolute value, and rational equation
 - ◆ Two quadratics (or exponential, absolute value, rational) equations
- Graph a system of inequalities, which introduces key feature of overlapping shaded regions.



ACTIVITY 3: Key Features with Desmos

Skills

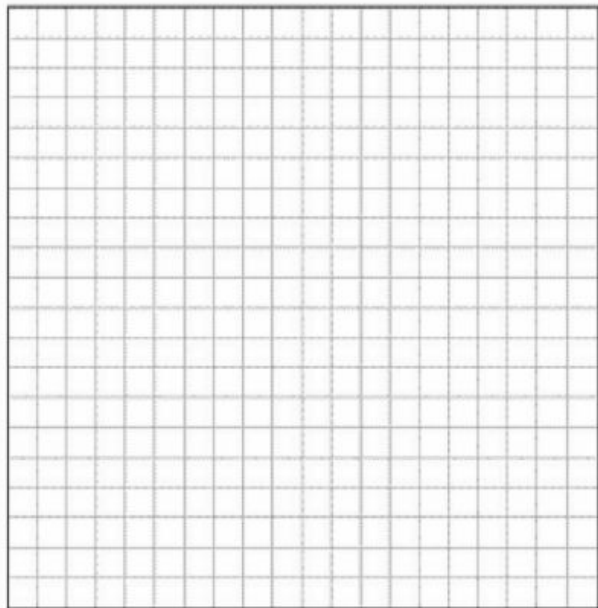
- Solve Systems
 - ◆ A1: A-REI.C.6, D.11, D.12
- Identify Key Features
 - ◆ A1: F-IF.B.4, C.7

Vocabulary

Solution
Maximum
Minimum
Zero
Vertex
Initial Value

Curriculum Connections

Graph the following function, and identify the key features of the graph: $f(x) = x^2 + 8x - 20$.



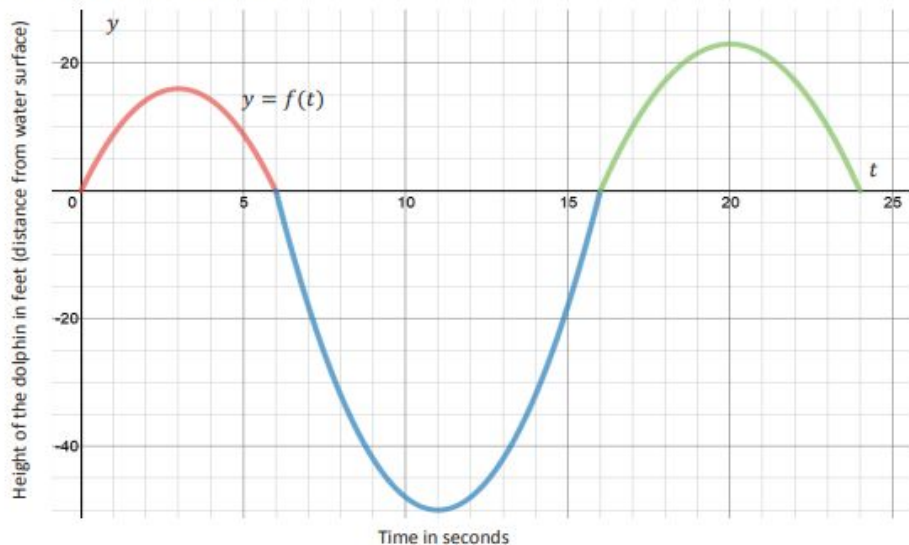
Eureka Module 4: Lesson 9

In the lesson, students must factor to identify zeroes for graphing. Vertex determination is open to vertex form or axis of symmetry formula.

Desmos can be used to verify graph created by student or to create the graph and student uses key features to graph his/her own followed by mathematical support.

Curriculum Connections

In a study of the activities of dolphins, a marine biologist made a 24-second video of a dolphin swimming and jumping in the ocean with a specially equipped camera that recorded one dolphin's position with respect to time. This graph represents a piecewise function, $y = f(t)$, that is defined by quadratic functions on each interval. It relates the dolphin's vertical distance from the surface of the water, in feet, to the time from the start of the video, in seconds. Use the graph to answer the questions below.



Eureka Module 4: Lesson 10

Instructional Suggestion:

- Have students identify and interpret key features of the graph.
- Interpret those points based on the context of the scenario, prior to answering any lesson questions.

Curriculum Connections

5. Evaluate each function for $x = -5$ and $x = \frac{4}{3}$.

a. $f(x) = 2x - 7$

b. $g(x) = 6x - x^2$

c. $h(x) = \frac{2}{x^2}$

Springboard Unit 2: Lesson 5-3

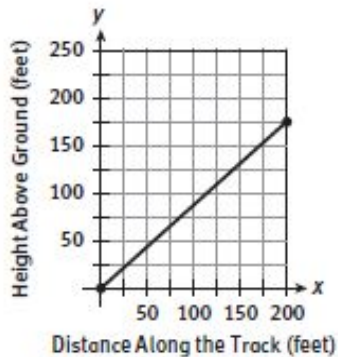
In the lesson, students must substitute each input to determine the necessary output.

Desmos can be used to verify solutions. This particular item is better used to practicing fluency with the Desmos tool.

- Format input
- Evaluating function for specific value
- Table Generator

Curriculum Connections

Suppose you got on a roller coaster called Cougar Mountain that immediately started climbing the track in a linear fashion, as shown in the graph.



Springboard Unit 2: Lesson 6-1

In the lesson, students must analyze the graph of a function and interpret key features of the function (domain, range, max/min)

Desmos can be used to approximate the equation of the function. Students can pick two points on the graph, plot them in Desmos, and use the slider tool to approximate the slope. Followed by mathematical support.

Curriculum Connections

2. Make a table of values for Galileo's function $h(t) = 1600 - 16t^2$.

t (seconds)	$h(t)$ (feet)
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

**Springboard Unit 2:
Lesson 7-2**

In the lesson, students must complete the table in order to graph the function specified.

Desmos can be used to generate the table for students or to evaluate the function at each specific value as a time-saving strategy.

Next Steps & Contacts

NEXT STEPS:

- Play around in Desmos! Go through these tools again and focus on incorporating them in a way that supports your instructional approach.
- View the interactive tutorials and videos provided by Desmos to learn even more of what Desmos has to offer.
- Attend (or Download presentation materials for) the Desmos 201 Session (Algebra I Intermediate) to learn about Desmos' instructional activities that can be used to support instruction.

CONTACTS:

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Questions???

