Unlocking math – teacher notes

In this differentiated activity, students will use their knowledge of functions and limited domains to do one of the following:

» Write equations to create the given heart lock.

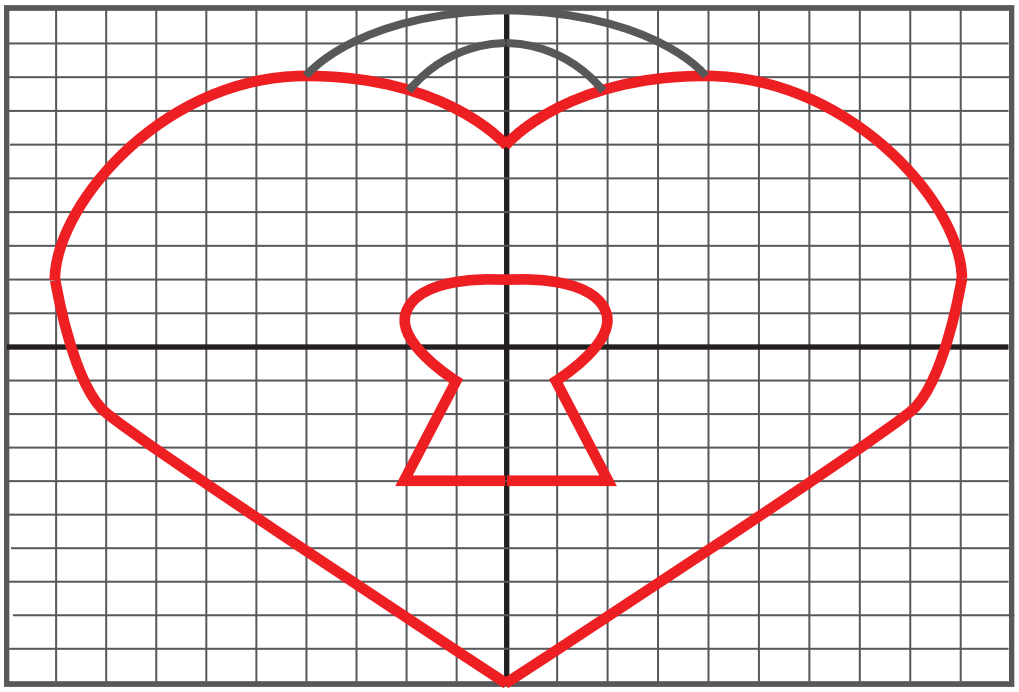
» Use their knowledge of transformations to produce the rest of the lock.

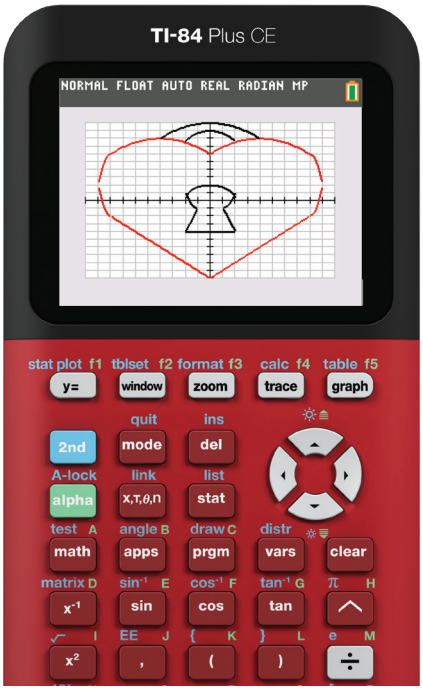
» Make their own lock design and write the corresponding equations.

Common Core Standards:

» CCSS.HSF.BF.B.3

» CCSS.HSF.IF.C





ACTIVITIES AND THEIR OBJECTIVES

Math loves functions

At the end of this activity students should be able to:

» Write equations from a graph.

» Identify the domain of each equation (identify the domains in each piecewise function).

Fixing a broken heart - transformations

At the end of this activity students should be able to:

» Use properties of function transformations to write the equations for the missing pieces of the cat face.

For this activity, use personal discretion on whether to share some, all, or none of the equations to students.

Locking in functions

At the end of this activity students should be able to:

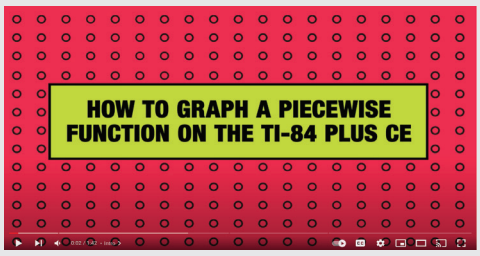
» Use their extensive knowledge of functions to write equations to create a unique graph of a cat face.

» Identify the domain of each equation (identify the domains for each piecewise function).

Introduction to piecewise functions

For these activities, students will need to know how to enter piecewise functions into their calculators.

You can play this quick how-to video for your class. **https://bit.ly/3SCT1fq**



Unlocking math functions – teacher notes

top of heart

$$f(x) = \begin{cases} -4\,(x+8)^2 + 6;\ -9 \le x < -8 \\ \left(-\frac{1}{8}\right)(x+4)^2 + 8;\ -8 \le x < 0 \\ \left(-\frac{1}{8}\right)(x-4)^2 + 8;\ 0 \le x < 8 \\ -4\,(x-8)^2 + 6;\ 8 \le x \le 9 \end{cases}$$

sides of heart

$$f(x) = \begin{cases} 4(x+8)^2 - 2;\ -9 \le x \le -8 \\ 4(x-8)^2 - 2;\ 8 \le x \le 9 \end{cases}$$

top of lock

$$f(x) = \left\{ \left(-\frac{1}{8}\right) x^2 + 10;\ -4 \le x \le 4 \right\}$$

$$f(x) = \left\{ \left(-\frac{1}{3}\right) x^2 + 9;\ -2 < x < 2 \right\}$$

bottom of heart

$$f(x) = \begin{cases} -x - 10;\ -8 \le x < 0 \\ x - 10;\ 0 \le x \le 8 \\ \text{OR} \\ |x| - 10;\ -8 \le x \le 8 \end{cases}$$

bottom of keyhole

$$f(x) = \begin{cases} 3x + 2;\ -2 \le x \le -1 \\ -3x + 2;\ 1 \le x \le 2 \end{cases}$$

$$f(x) = \left\{ -4;\ -2 \le x \le 2 \right\}$$

sides of keyhole

$$f(x) = \begin{cases} 2(x+1)^2 - 1;\ -2 \le x \le -1 \\ 2(x-1)^2 - 1;\ 1 \le x \le 2 \end{cases}$$

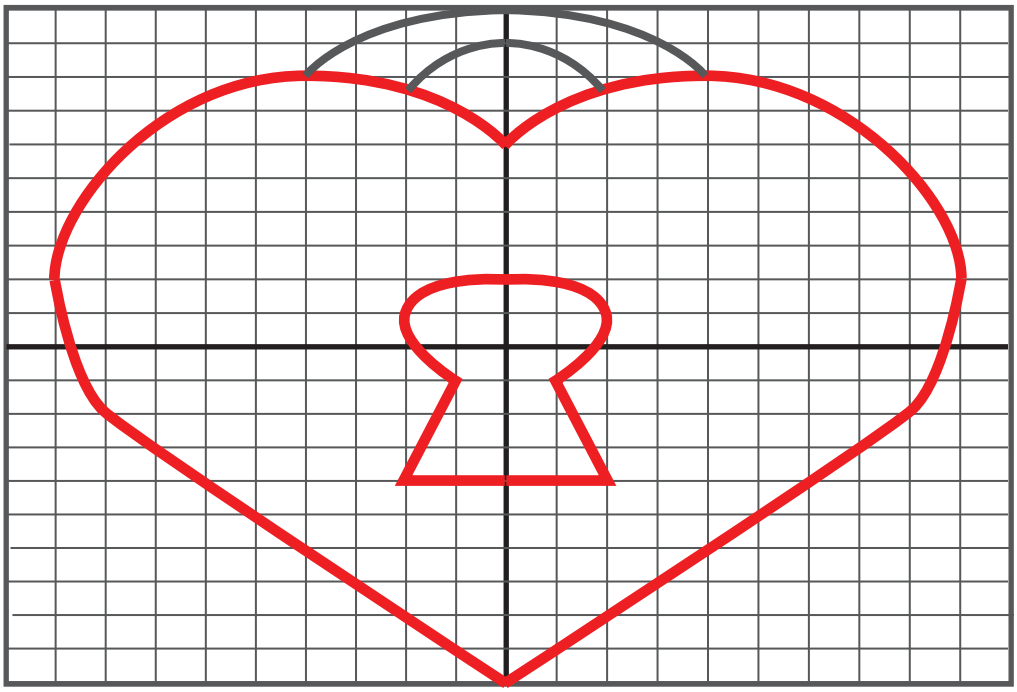
top of keyhole

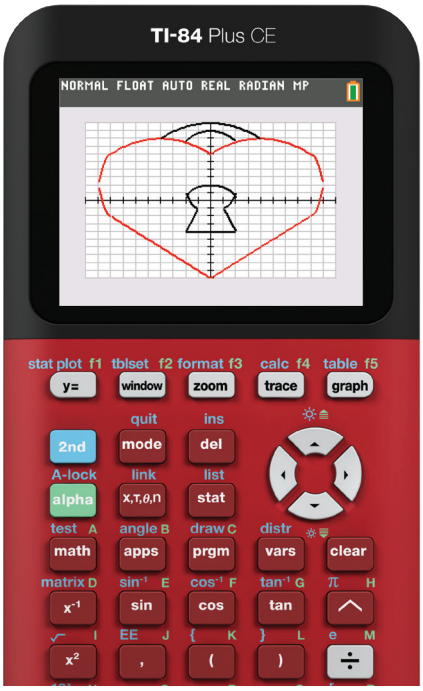
$$f(x) = \left\{ \sqrt{4 - x^2} + 1;\ -2 \le x \le 2 \right\}$$

Name: _____ Date: _____

Math loves functions

Let's draw a heart shaped lock! First, determine the equations used to make this image. Try breaking down the image into the parts below. Hint: the number of functions used is indicated in the parentheses. Next, enter the equations into your calculator to visualize the equations all together!





Top of lock (2):

Sides of heart (2):

Top of heart (4):

Bottom of heart (2 or 1):

Bottom of the keyhole (2):

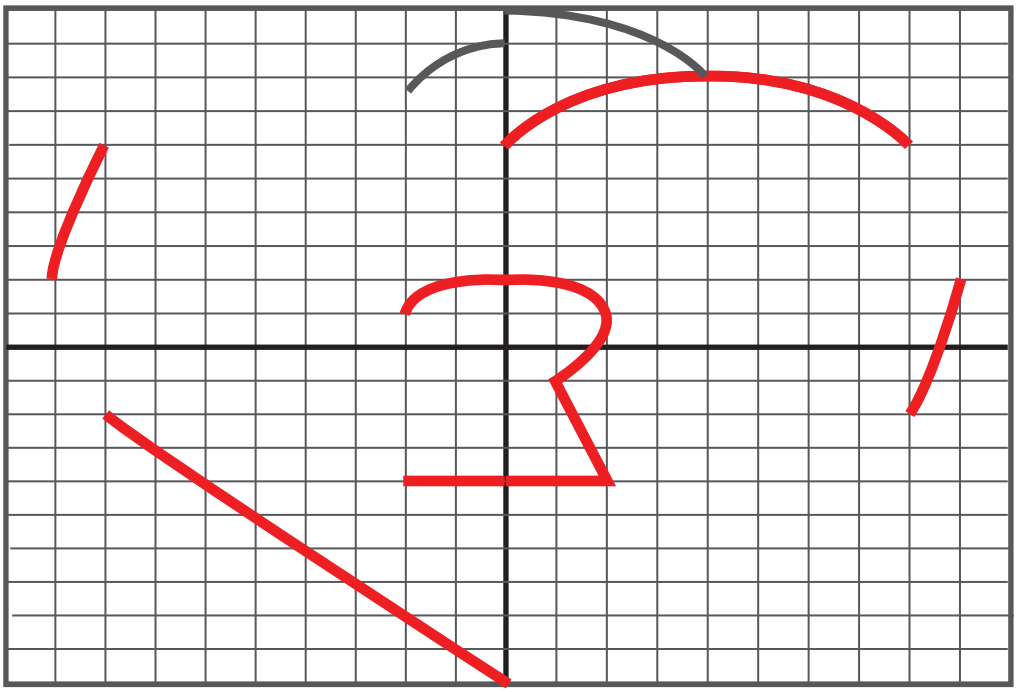
Sides of keyhole (2):

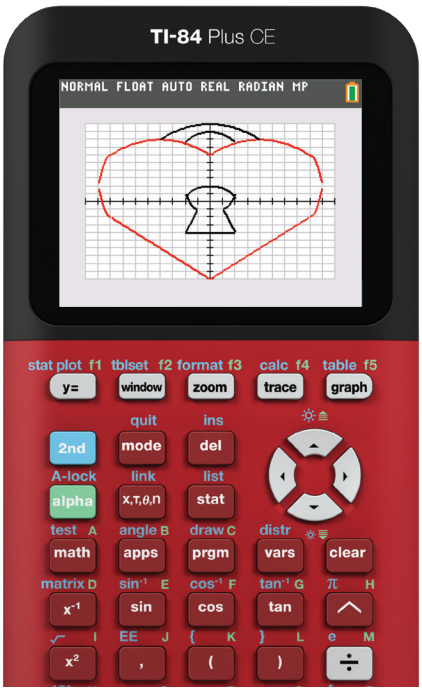
Top of keyhole (1):

Name: _____ Date: _____

Fixing s broken heart - transformations

This heart lock has broken, but it can be fixed! Determine the equations needed to finish the picture. Next, enter the equations into your calculator to finish the transformation.





Top of Lock (2):

Sides of heart (2):

Top of heart (4):

Bottom of Heart (2 or 1):

Bottom of the Keyhole (2):

Sides of Keyhole (2):

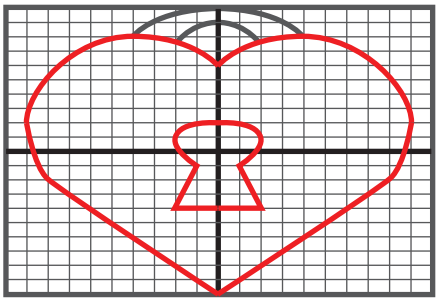
Top of Keyhole (1):

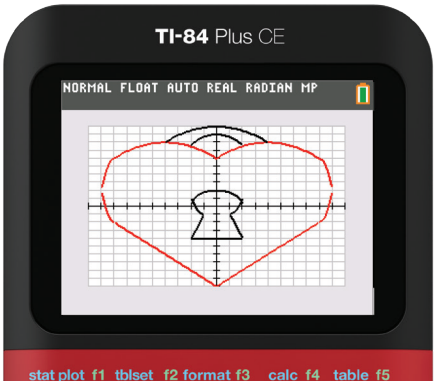
Name: _____ Date: _____

Locking in functions

Let's lock in our knowledge of functions with some Valentine's Day fun! Use the provided image as inspiration to make your own "heart lock". Draw your own design, then try breaking it down into parts. Next, enter the equations into your calculator to visualize the equations all together!

Example:





Draw your own Valentine's Day inspired lock.

Determine your functions below. Graph them on your calculator to check your work.

Math is key activities – teacher notes

In this differentiated activity, students will use their knowledge of functions and limited domains to do one of the following:

» Write equations to create the given key design.

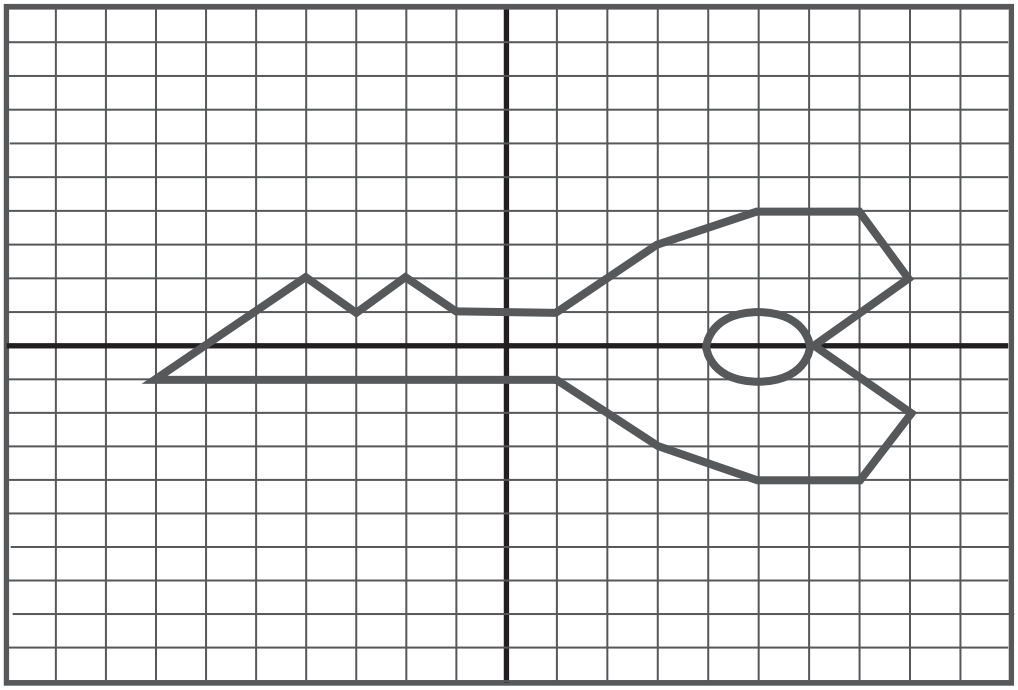
» Use their knowledge of transformations to produce the key.

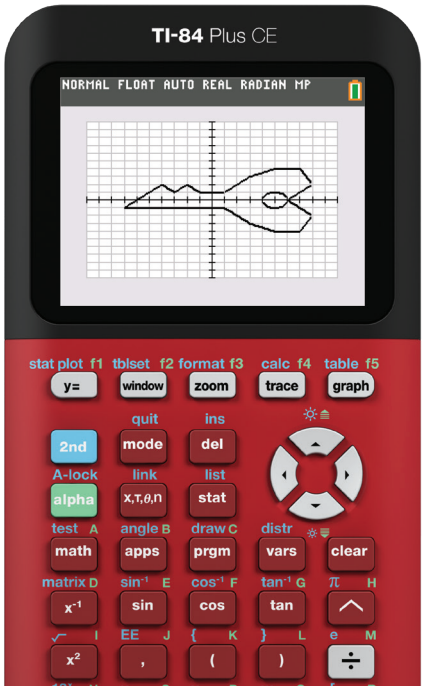
» Make their own key and write the corresponding equations.

Common Core Standards:

» CCSS.HSF.BF.B.3

» CCSS.HSF.IF.C





ACTIVITIES AND THEIR OBJECTIVES

Key to the heart of functions

At the end of this activity students should be able to:

» Write equations from a graph.

» Identify the domain of each equation (identify the domains in each piecewise function).

The right fit - transformations

At the end of this activity students should be able to:

» Use properties of function transformations to write the equations for the missing pieces of the bat.

For this activity, use personal discretion on whether to share some, all, or none of the equations to students.

The key to math love

At the end of this activity students should be able to:

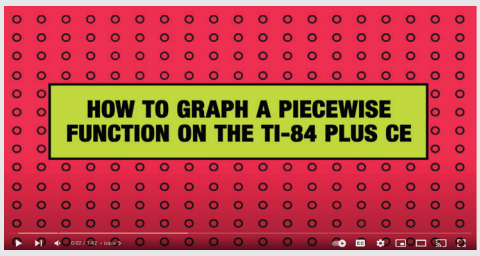
» Use their extensive knowledge of functions to write equations to create a unique graph of a bat.

» Identify the domain of each equation (identify the domains for each piecewise function).

Introduction into piecewise function

For these activities, students will need to know how to enter piecewise functions into their calculators.

You can play this quick how-to video for your class. **https://bit.ly/3SCT1fq**



Math is key functions – teacher notes

$$f(x) = \begin{cases} -1;\ -7 \le x < 1 \\ -x;\ 1 \le x < 3 \\ \left(-\frac{1}{2}\right)x - \frac{3}{2};\ 3 \le x < 5 \\ -4;\ 5 \le x < 7 \\ 2x - 18;\ 7 \le x \le 8 \end{cases}$$

bottom of key

$$f(x) = \begin{cases} x + 6;\ -7 \le x < -4 \\ -x - 2;\ -4 \le x < -3 \\ x + 4;\ -3 \le x < -2 \\ -x;\ -2 \le x < -1 \\ 1;\ -1 \le x < 1 \end{cases}$$

teeth of key

$$f(x) = \begin{cases} x;\ 1 \le x < 3 \\ \frac{1}{2}x + \frac{3}{2};\ 3 \le x < 5 \\ 4;\ 5 \le x < 7 \\ -2x + 18;\ 7 \le x < 8 \end{cases}$$

top right of key

$$f(x) = \begin{cases} x - 6;\ 6 \le x \le 8 \end{cases}$$

$$f(x) = \begin{cases} -x + 6;\ 6 \le x \le 8 \end{cases}$$

key indent

$$f(x) = \begin{cases} \sqrt{1 - (x - 5)^2};\ 4 \le x \le 6 \end{cases}$$

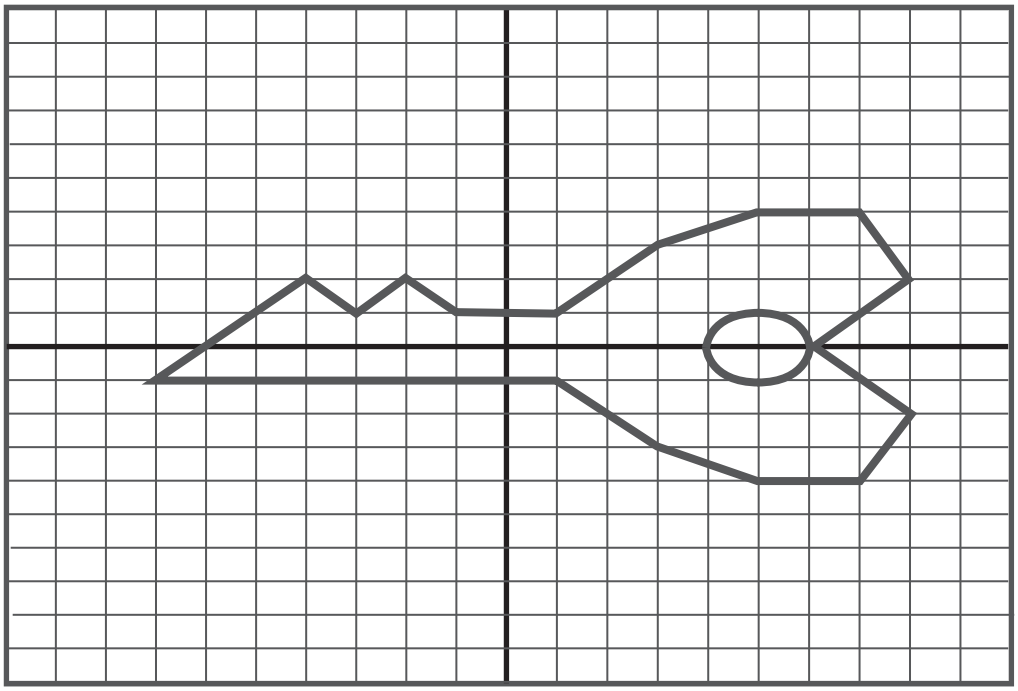
$$f(x) = \begin{cases} -\sqrt{1 - (x - 5)^2};\ 4 \le x \le 6 \end{cases}$$

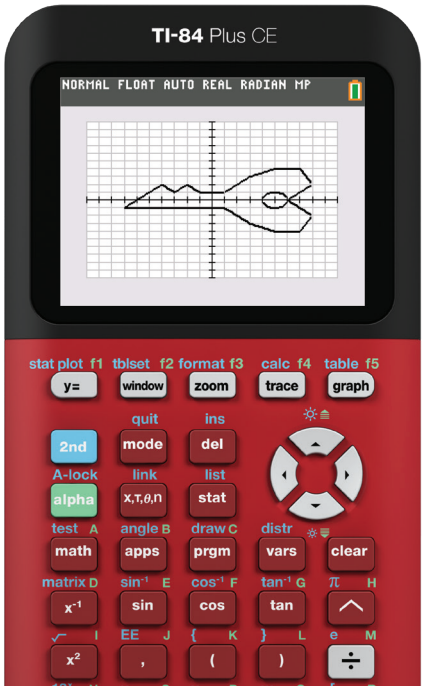
key ring hole

Name: _____ Date: _____

Key to the heart of unctions

Let's draw a Valentine's Day inspired key! First, determine the equations used to make this image. Try breaking down the image into the parts below. Hint: the number of functions used is indicated in the parentheses. Next, enter the equations into your calculator to visualize the equations all together!





Bottom of the key (5)

Key teeth (5)

Top right of key (4)

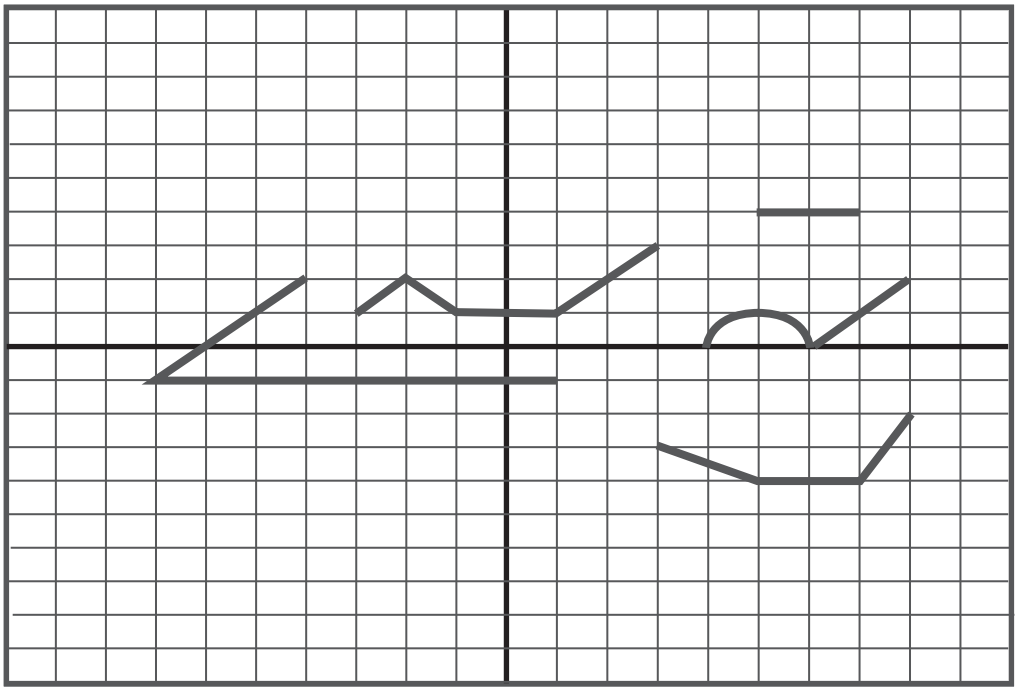
Key indent (2)

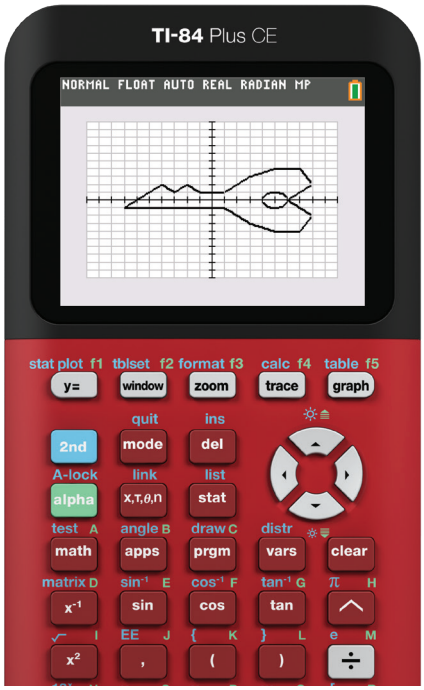
Keyring hole (2)

Name: _____ Date: _____

The right fit - transformations

This key is missing it's pieces. Let's find the right equations that fit. Determine the equations needed to finish the picture. Next, enter the equations into your calculator to finish the transformation.





Bottom of the key (5)

Key teeth (5)

Top right of key (4)

Key indent (2)

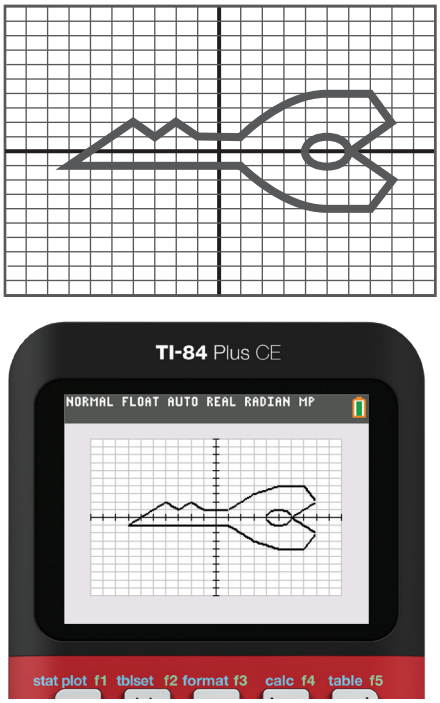
Keyring hole (2)

Name: _____ Date: _____

The key to math love

Let's lock in our knowledge of functions with some Valentine's Day fun! Use the provided image as inspiration to make your own "heart key". Draw your own design, then try breaking it down into parts. Next, enter the equations into your calculator to visualize the equations all together!

Example



Draw your own Valentine's Day inspired key

Determine your functions below. Graph them on your calculator to check your work.