Exploring Parabolas

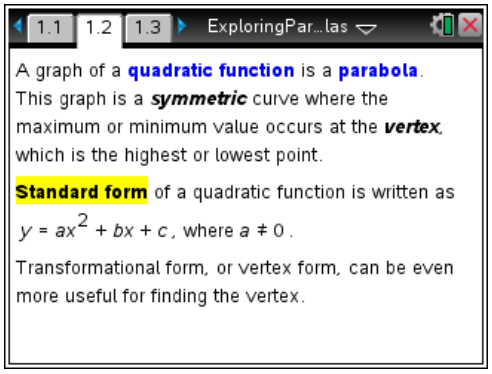
Student Activity

Name _____

Class _____

Problem 1 – Transformational Form of the Equation of a Parabola

Move to page 1.2. Read the information on the page.



Recall the equation of line in point slope form:

$y - y_1 = a(x - x_1)$, where *a* represents slope

Written differently, the linear equation above can take on the form: $y = a(x - h) + k$ where $x_1 = h$ and $y_1 = k$.

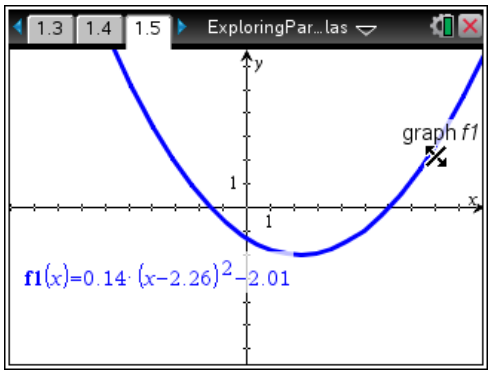
1. What is the difference between this linear equation and the quadratic function $y = a(x - h)^2 + k$?

Move to page 1.4. Read the information on the page.

Using TI-Nspire technology, a parabola can be explored by grabbing (ctrl) and translating or changing .

Move to page 1.5.

Move the cursor until you see the symbol . Observe the changes in both the graph and the equation.



2. For $y = ax^2$, if *a* is less than zero, the parabola _____.

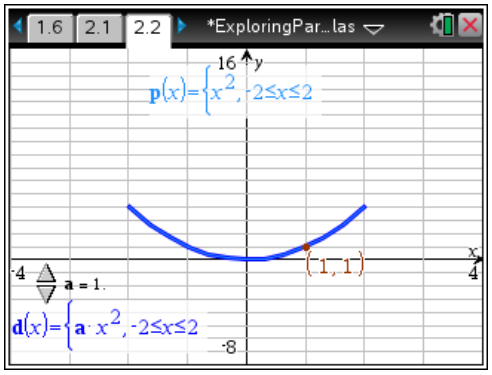
a. opens up
b. opens to the right
c. opens down
d. opens to the left

Problem 2 – The Role of the "a" Value

Move to page 2.1. Read the information on the page.

On page 2.2, select the up and down arrows next to **a=**, to change the value of *a* for the parabola $d(x) = ax^2$ defined on the interval $-2 \le x \le 2$.

On pages 2.3 and 2.4, read the story "The Parent Parabola".



3. What effect does changing the value of *a* in $y = ax^2$ have on the shape of the parabola?

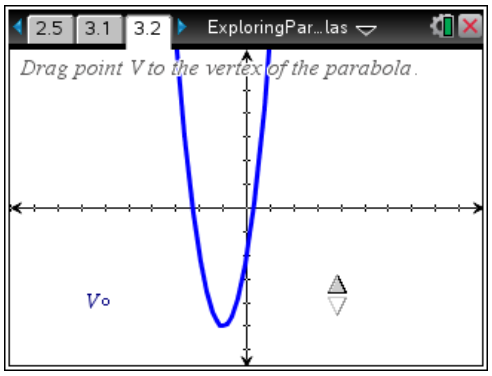
   It changes the _____.

   a. horizontal scale factor or stretch
   b. vertical scale factor or stretch
   c. horizontal shift
   d. vertical shift

Problem 3 – The Vertex of the Parabola

Move to page 3.1. Read the information on the page.

On page 3.2, drag the point *V*, to the vertex of the parabola given. When you are successful, you will receive a message. To generate a new parabola, select the up arrow at the bottom right of the screen. Move point *V* to the vertex for at least three different parabolas.



Move to page 3.3.

4. Consider the symmetry of a parabola. Identify the coordinates of the vertex for each parabola.

Move to page 3.4.

5. Is the vertex shown in the graph a minimum or a maximum?

Problem 4 – The Axis of Symmetry of a Parabola

Move to page 4.1. Read the information on the page.

For graphs of functions of the form $y = ax^2$, the vertex is at the origin and the axis of symmetry is the *y*-axis, or *x*=0.

On page 4.2, select the up arrow next to Step, to see how the graph of $y = \frac{1}{2}x^2$ can be graphed by hand.

Problem 5 – Analyzing the Graph of a Parabola

Move to page 5.1. Read the information on the page.

On page 5.2, explore a quadratic function by grabbing the parabola near the vertex when ✣ appears. Press menu **> Analyze Graph > Analyze Conics > Vertices** and **Axes of Symmetry**. To translate the parabola again, press tab to get select graph **f1**.Here you can change the parabola back to $f1(x) = x^2$.