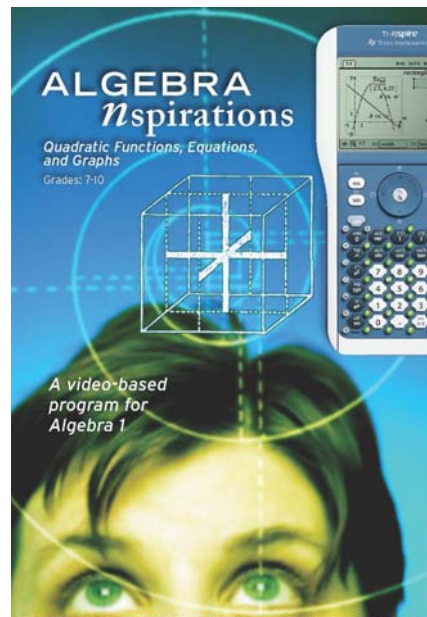




ALGEBRA NSPIRATIONS

Quadratic Functions, Equations, and Graphs



Teacher's Guide

Series Overview

For Algebra 1 teachers looking for a video resource that uses graphing calculators, *Algebra Inspirations* provides an ideal solution. Each program in this series focuses on a key topic in algebra and uses real-world examples to explore these topics. In addition, all the relevant calculator keystrokes for the TI-Nspire calculator are provided. In addition, Math Labs allow for hands-on exploration of these topics.

Program Overview













In this program the TI-Nspire is used to explore the nature of quadratic functions. Examples ranging from space travel and projectile motion provide real-world examples for discovering algebraic concepts. All examples are solved graphically. The teacher's guide provides all keystrokes shown in the video, as well as providing support for TI-84 users. Algebra teachers looking to integrate hand-held technology into their instruction will benefit greatly from this series.


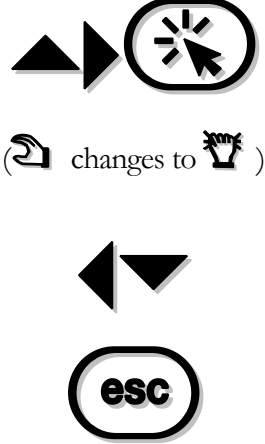
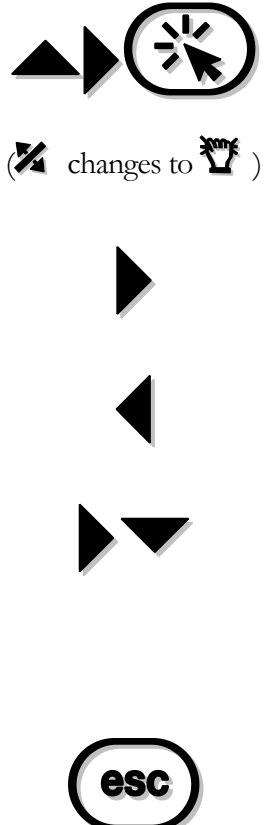

Concepts explored: Quadratic functions and equations, standard form, graphing quadratic equations, solving quadratic equations graphically

Grades: 7-10

Investigation 1

In this part of the program, students investigate the properties of the simplest quadratic function: $f(x) = ax^2$. This is then followed by functions of the form $f(x) = ax^2 + c$.

TI- <i>n</i> spire Keystrokes	
Turn on the <i>n</i> spire.	
Press the home key followed by 6, or ctrl N to open a new document.	  OR  
A previous document may be open: if so, a prompt will ask if you wish to save the document. Click to choose “yes” or press tab then click to choose “no.”	 OR  
Select 2 to create a Graphs and Geometry Page.	
The blinking cursor is on the function entry line, by f1(x). Enter the simplest quadratic function x^2 .	 
\ Press enter to graph.	

<p>Press esc to move to the work area. Press ctrl G to hide the entry line.</p>	
<p>Let's begin by moving the graph's equation. Hover over the text of equation with the pointer: it becomes an open hand. Click and hold until the open hand turns into a closed hand. Use the left and down arrows to drag the equation to the lower left area of the monitor.</p> <p>Press esc to exit grab-and-drag mode.</p>	
<p>Move the pointer near the top of the screen to grab the right branch of the graph, The pointer changes to a diagonal line segment over a double arrow. Click and hold until it turns into a closed hand. Use the arrows on the NavPad to drag the right branch down to open the graph. Do so slowly to see the changes in the value of the coefficient a.</p> <p>Now move the branch back up and make the graph very narrow. Indeed the value of a increases.</p> <p>Next, drag the branch down to the right again, but this time flipping the cup-like graph so it opens downward. Move the graph slowly to observe the changing values of a.</p> <p>Press esc to exit grab and move mode.</p>	
<p>Press ctrl + menu, then 4 to delete the graph. Press tab to move to the entry line.</p>	

Type x-squared, then press enter to graph.

Enter three more functions in the same way: x-squared + 3; x-squared + 8; and x-squared - 7.

The image shows a sequence of calculator keypad icons for entering functions. The first row shows the 'X' button, the 'x^2' button, and the 'enter' button. The second row shows 'X', 'x^2', '+', and '3'. The third row shows 'enter', 'X', 'x^2', and '+'. The fourth row shows '8', 'enter', 'X', and 'x^2'. The fifth row shows '-', '7', and 'enter'.

Assessment

Graph the following quadratic functions.

1. $y = 3x^2$

3. $y = -2x^2$

5. $y = 0.8x^2$

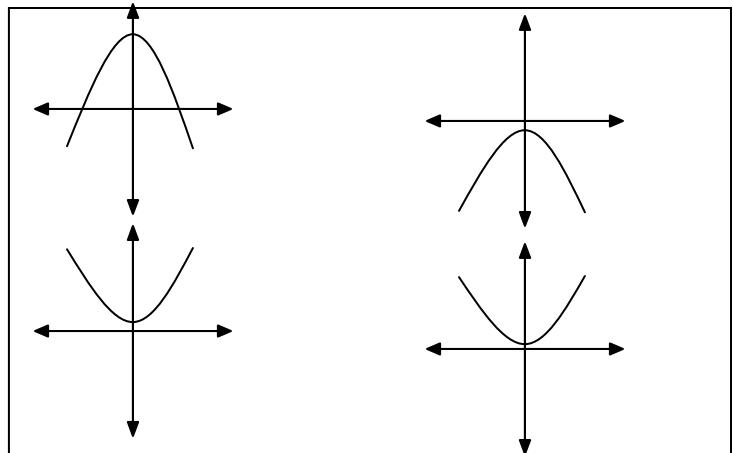
2. $y = x^2 + 5$

4. $y = x^2 - 2.5$

6. $y = -x^2 + 5$






















Match the descriptions of a and c with the graph.

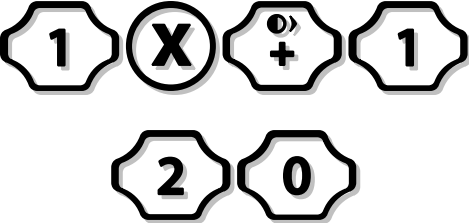

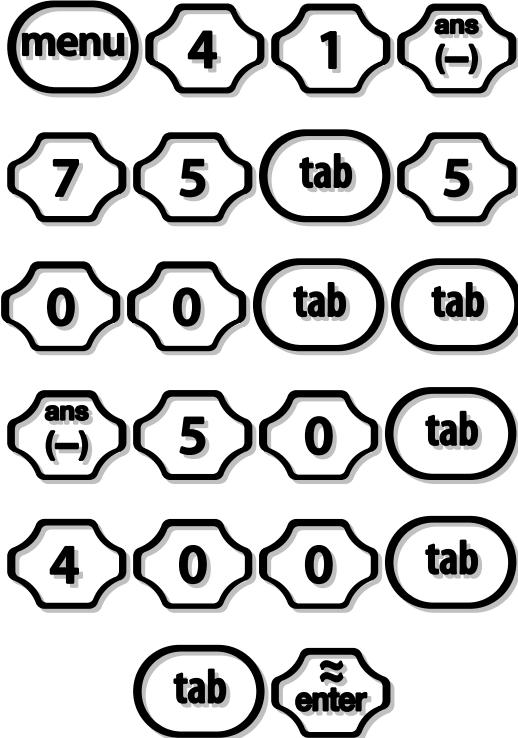
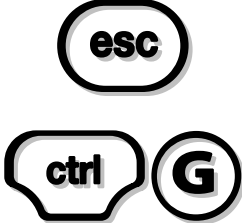

	a	c
1.	<0	<0
2.	>0	>0
3.	<0	>0
4.	>0	<0

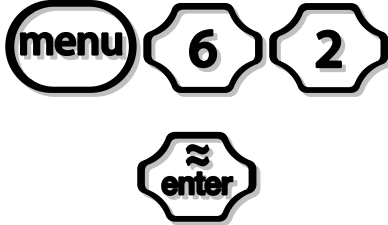
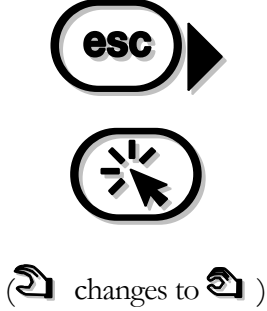
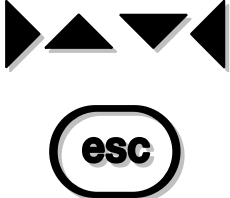
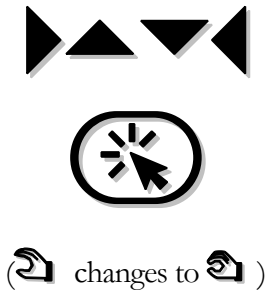



Investigation 2

In this part of the program, students solve a quadratic equation graphically in the context of space travel.

TI- <i>N</i> spire Keystrokes	
Turn on the <i>N</i> spire.	
Press the home key followed by 6, or ctrl N to open a new document.	  OR  
A previous document may be open: if so, a prompt will ask if you wish to save the document. Click to choose “yes” or press tab then click to choose “no.”	 OR  
Select 2 to create a Graphs and Geometry Page.	
The blinking cursor is on the function entry line, by $f1(x)$. Type in $-.0049x^2 + 2.11x + 120$	           

	
<p>Press enter to graph. Surprised there's no graph? It's there, but out of the viewing window.</p>	
<p>Press menu, 4 and 1 for the window settings.</p> <p>--Set xMin to -75 in order to see the y axis. Press tab to move from one entry to the next;</p> <p>--Set xMax to 500; that's more than 8 minutes;</p> <p>--Set yMin to -50—again to see the x-axis—and yMax to 400.</p> <p>Then Click OK.</p>	
<p>Press esc to move the arrow to the work area.</p> <p>Also press ctrl G to hide the entry line.</p>	
<p>Now let's find the points where y equals 340. Use the NavPad to move the arrow to a point on the graph, about halfway between the y-intercept</p>	

<p>and the vertex: it becomes a finger-pointing hand.</p> <p>Press Menu, 6, and 2 to place a point on the graph. Click and the pencil will plot it.</p>	
<p>Press Esc to exit Point On mode. An open hand is now hovering over the point. Using the NavPad, move the open hand over the point's coordinates.</p> <p>Click and hold until it changes to a closed hand.</p>	
<p>Use the NavPad to drag the coordinates to the center of the screen. Press esc to exit grab and drag mode.</p>	
<p>Move the pointer back over to that point on the graph until it becomes an open hand. Click and hold until it changes to a closed hand.</p>	
<p>Press the right arrow until the y-coordinate approaches 340. Notice this first occurs at x equals about 177. Keep pressing the right arrow until you see an M for maximum—the highest part of the graph. Keep sliding to the right until y approaches 340 once again. This time x is about 251.</p>	

Assessment

Solve each quadratic equation graphically.

1. $x^2 + 2x - 3 = 25$

2. $x^2 + x - 12 = 50$

3. $x^2 - 9x + 20 = 100$

4. $6x^2 - 20x + 6 = 75$

5. $5x^2 - 6x + 12 = 50$