

Introduction to Quadratic Equations

By Sonja Barrera

Time required
45 minutes

Topic: Introduction to Quadratic Equations

- *Students will begin by plotting points from a table to create a parabola.*
- *Students will also explore the parts of a parabola and see how they relate to the function table.*

Activity Overview

This activity allows students to gain an understanding of how to graph a quadratic equation. They will begin by using a Lists and Spreadsheet page to find the y-values of a specific function. They will then plot the x and y-values using a scatter plot to see the shape of the parabola. On top of this scatter plot, they will graph the function. After doing a couple of examples like this, they will then graph a quadratic equation and explore the graph to find the maximum or minimum and the roots. They will also see the function table associated with their graph.

Teacher Preparation

This activity is designed for use in an algebra classroom.

Prior to beginning the activity, students should be familiar with graphing a line by using a table and by using the handheld.

- *Refer to the screenshots on page 4 and 5 for a preview of the completed student TI-Nspire document (.tns file).*

Classroom Management

- *This activity is intended to be a **teacher-led** activity with students following along on their handhelds.*

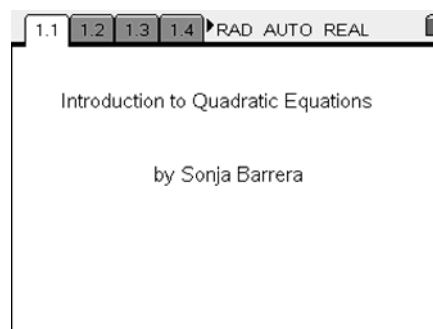
TI-Nspire™ Applications

Lists and Spreadsheets, Graphs and Geometry, Notes

Introduction to Quadratic Equations

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TEACHER WORKSHEET



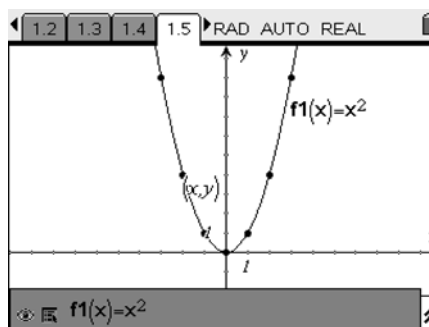
Problem 1 – Graphing a Parabola by using a Table

STEP 1: Students will use the Lists and Spreadsheets page to square each of the x-values listed in column B. Highlight the diamond row of column B and type $=x^2$ and press ENTER. The handheld will ask if this is a column or variable reference, choose variable reference. This should fill in column B with the square of the number in column A.

A screenshot of a handheld calculator spreadsheet. The columns are labeled A, B, C, and D. Column A contains x-values from -5 to -1. Column B contains the corresponding y-values, which are the squares of the x-values. The formula $=x^2$ is shown in the header row of column B. The status bar at the bottom shows "B1 =25".

A	B	C	D
x	y		
	$=x^2$		
1	-5	25	
2	-4	16	
3	-3	9	
4	-2	4	
5	-1	1	

STEP 2: On the Graphs and Geometry page students will create a scatter plot of the information in the table. Press Menu and Graph type, change to the scatter plot. Choose x for the x-values and y for the y-values. The students should see the points on their graph.



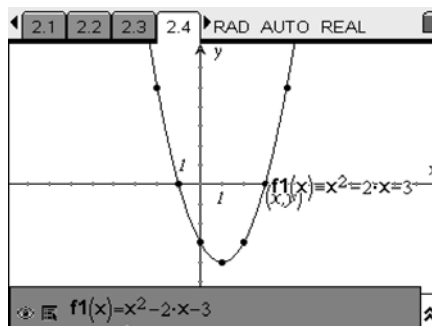
STEP 3: Go back to the graph page and press Menu and Graph type, change to function. Type x^2 in the function line and press Enter. The students should see the parabola on their graph.

Problem 2 – Another Example

STEP 1: Students will use the Lists and Spreadsheets to find the y-values for the function $y = x^2 - 2x - 3$. Highlight the diamond row of column B and type $=x^2 - 2x - 3$ and press ENTER. The handheld will ask if this is a column or variable reference, choose variable reference. This should fill in column B with the y-values for the function.

A	B	C	D
	=x^2-2*x-		
1	-2	5	
2	-1	0	
3	0	-3	
4	1	-4	
5	2	-3	

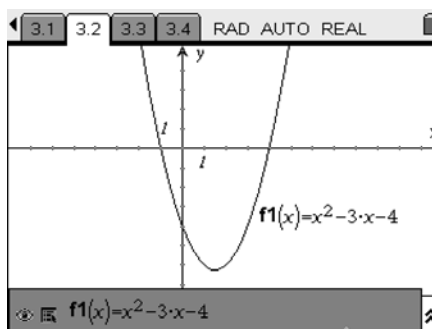
STEP 2: On the Graphs and Geometry page students will create a scatter plot of the information in the table. Press Menu and Graph type, change to the scatter plot. Choose x for the x-values and y for the y-values. The students should see the points on their graph.



STEP 3: Go back to the graph page and press Menu and Graph type, change to function. Type $x^2 - 2x - 3$ in the function line and press Enter. The students should see the parabola on their graph.

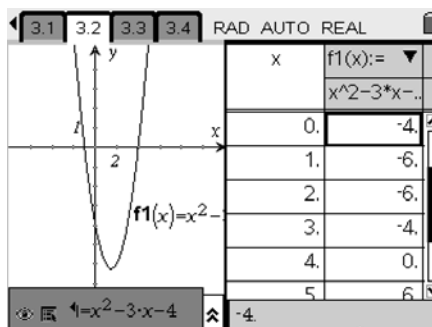
Problem 3 – Graphing without using a table first

STEP 1: Students will graph the function, $y = x^2 - 3x - 4$. On the Graphs and Geometry page, students should type $x^2 - 3x - 4$ in the function line and press enter. They will see the function on their graph.



STEP 2: Students will explore their parabola and find the minimum and the roots. To find the roots and minimum, Press Menu, Trace, Graph Trace. Use the left/right arrows to trace along the graph. Notice what happens when you reach a zero or the minimum.

STEP 3: Students will add a function table to the graph. Press Menu, View, add Function Table. Have the students look at the function table to see if they can determine where the roots are and how they can find them by looking at the table.



Introduction to Quadratic Equations

TI-Nspire Solution File

1.1 1.2 1.3 1.4 RAD AUTO REAL

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1.1 1.2 1.3 1.4 RAD AUTO REAL

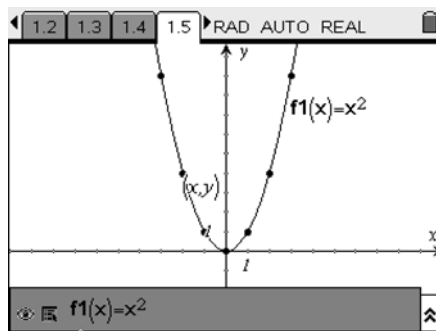
In this activity, you will begin by plotting points to graph a quadratic equation. On the next page, you will see a "Lists and Spreadsheet" page. The values from -5 to 5 have been added in column A. Use a formula in column B to square those values.

1.1 1.2 1.3 1.4 RAD AUTO REAL

A	x	B	y	C	D
			=x^2		
1	-5		25		
2	-4		16		
3	-3		9		
4	-2		4		
5	-1		1		
B1			=25		

1.1 1.2 1.3 1.4 RAD AUTO REAL

On the next page, you will plot those points on a graph. Notice the shape of the graph.



1.3 1.4 1.5 1.6 RAD AUTO REAL

Now, we are going to graph the equation $y=x^2$ over the points we have graphed. Go back to page 1.5 and graph the function $y=x^2$. Notice that all of the points we plotted are on this graph.

1.4 1.5 1.6 2.1 RAD AUTO REAL

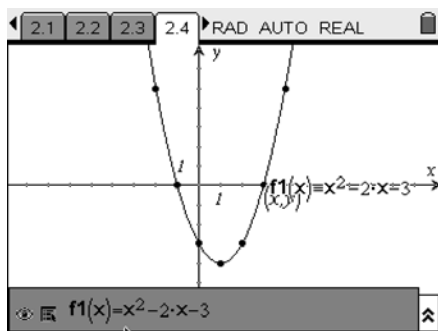
The graph of a quadratic equation is called a parabola. We will graph one more parabola by plotting points. On the next page is another spreadsheet with the x-values filled in. You are going to graph the equation $y=x^2-2x-3$

1.5 1.6 2.1 2.2 RAD AUTO REAL

A	x	B	y	C	D
			=x^2-2*x-		
1	-2		5		
2	-1		0		
3	0		-3		
4	1		-4		
5	2		-3		
B1			=5		

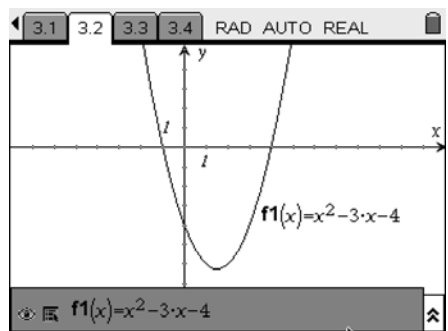
1.6 2.1 2.2 2.3 RAD AUTO REAL

On the next page, plot the points from your spreadsheet. Again, notice the shape of the graph. After you have plotted the points, graph the function.



2.4 3.1 3.2 3.3 RAD AUTO REAL

The handheld can graph the equation and then show you the points that it used. On the next page, you will graph the equation $y=x^2-3x-4$



3.1 3.2 3.3 3.4 RAD AUTO REAL

There are many important parts of a parabola. Go back to the graph and trace the parabola to find the roots (zeroes) and the minimum.

3.1 3.2 3.3 3.4 RAD AUTO REAL

Now that you can see the graph, let's look at the table of values. Go back to the graph and add a function table. This will show you some of the points that are on the graph of the equation $y=x^2-3x-4$.

