

Exploring Quadratics in Factored Form

by Patricia Kehoe

Activity overview

In this activity students will use TI-Nspire to investigate the graphical representations of a quadratic relation in the form $y = x^2 + bx + c$ and the same relation in the factored form $y = (x - r)(x - s)$.

Concepts

This lesson was developed for the MFM2P course in the Ontario Mathematics Curriculum. At this point in the course students will have had some introductory activities looking at the graphs of quadratic functions using the form $y = ax^2 + bx + c$. They should be familiar with terms parabola, direction of opening, vertex, axis of symmetry, x and y intercepts, maximum and minimum values.

Teacher preparation

In this activity students will be using the TI-Nspire technology to explore quadratic functions in factored form. Prior to this lesson it would be helpful if students had worked through a skill building exercise so that they were comfortable entering equations, graphing functions, and tracing on a Graphs and Geometry page as well as factoring expressions on a CAS Calculator page.

Classroom management tips

Ideally, each student should complete this activity with their own TI-Nspire handheld. Working in pairs on the activity will allow students to trouble-shoot together and share tips for using the technology.

TI-Nspire Applications

Graphs & Geometry Page: Entering an equation, graphing it, and tracing to find ordered pairs
CAS Calculator Page: Factoring quadratic expressions

Step-by-step directions




To start the activity students should reflect on the quadratic equations they have looked at to this point. Those quadratics will have been in the form $y = ax^2 + bx + c$.

Review with students what they know about the graphs of quadratics in the form $y = ax^2 + bx + c$ i.e. the direction of the opening and the coordinates of the y -intercept. Students can fill in the chart on the student worksheet and do question #1 on their own to review this concept (see document: **Exploring Quadratics in Factored Form Student**).

To introduce the next part of the activity the teacher should work through one example with the students. The following step-by-step directions can be reproduced for students to follow along and use for reference when working independently.

Graphing Quadratics in Factored Form

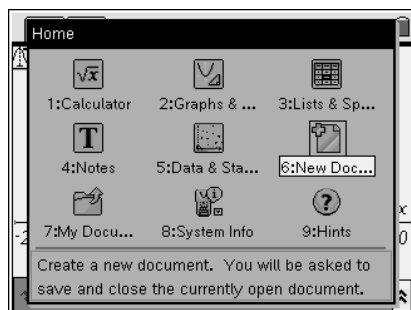
Turn the calculator on. 



Press    and under **Display Digits** select **Float 2** by clicking on the pull down menu.

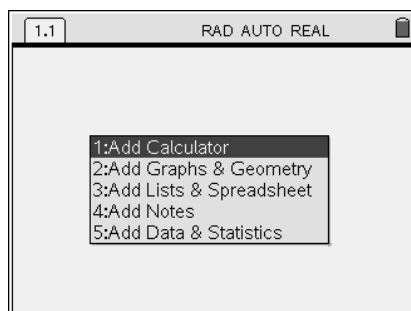
Press .

Use the  key to tab down to **Apply to System** and press .

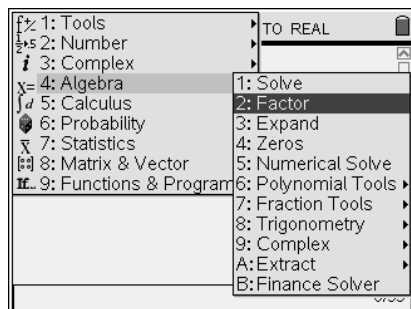
Click on **OK** when asked "Do you wish to apply current settings to system settings?".






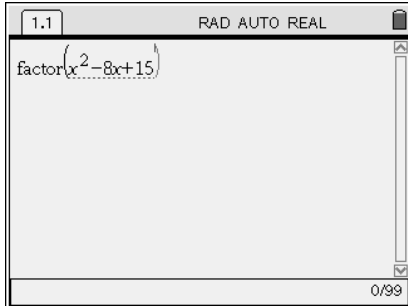
Press   to open a new document



Select **1:Add Calculator**. (If you are asked if you wish to save a previous document, click on "No").

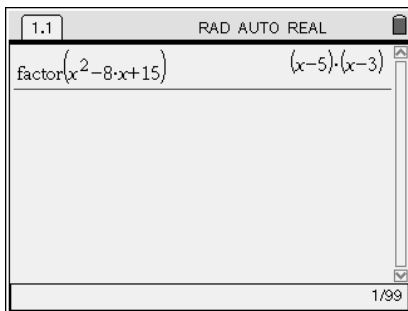




Press    to access the factor command

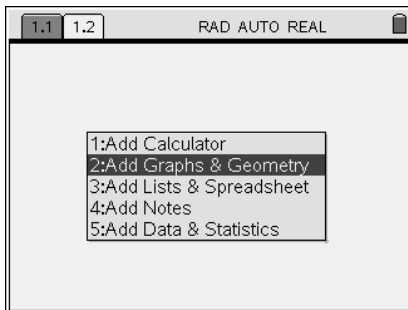




Type in the quadratic expression between the brackets.

Press .

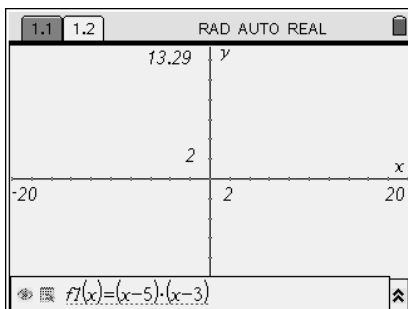




On the right side of the screen is the factored form of the quadratic. This is the expression to be used to graph the relation. (You could copy it by using the up arrow on the nav pad until the expression is highlighted and then press  .

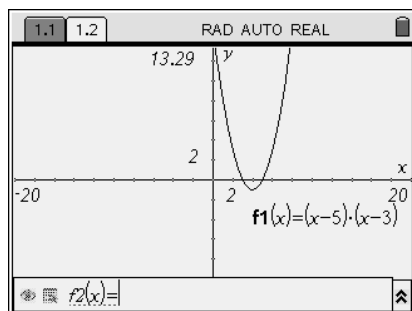


Press   to move to a new page.

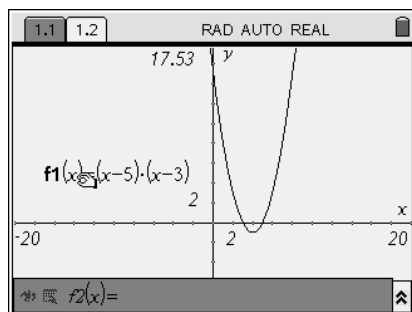
Select **2:Add Graphs & Geometry**



Type in the equation in the **f1** position at the bottom of your screen. (If you copied the expression from the calculator page you can now paste it in by pressing  .



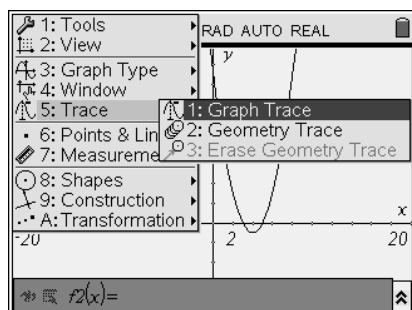
Press **enter** and **esc**



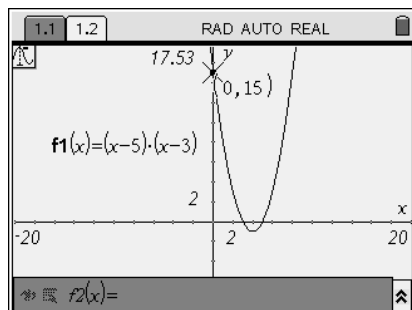
Use the arrow keys on the nav pad to move the cursor to the equation title on the screen. You will see an open hand appear.

Grab the equation by pressing **ctrl** **enter** **clear**. The hand will close and you can then use the arrows on the nav pad to move the equation to a more convenient spot on your screen.

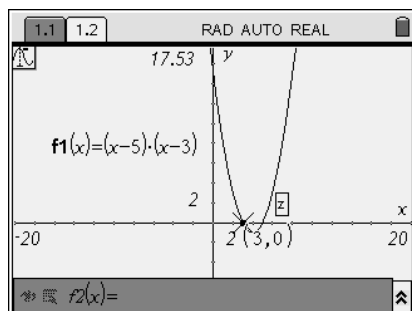
Press **esc**.



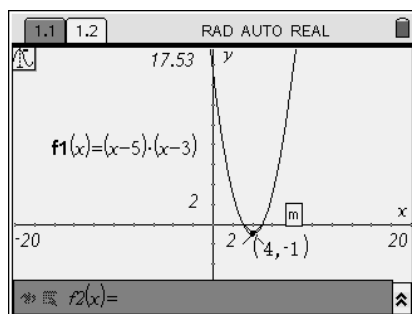
Press **menu** **5** **1** in order to access the trace command to locate specific points on your graph.



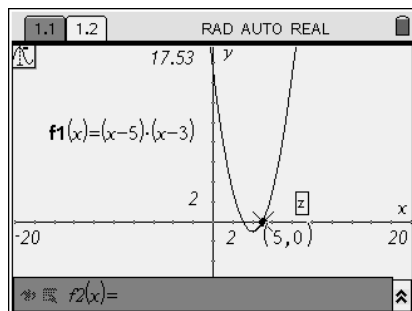
The first ordered pair you will see in the y-intercept.
Use the right arrow keys on your nav pad to find other points.



When you reach an x-intercept (or zero) of the graph you will see a small **z** appear beside the ordered pair.



If you continue to trace using the right arrow of the nav pad you will find the vertex or minimum point. A small **m** will appear on the screen near the ordered pair.



Continue tracing until you find the other x-intercept.

Record the ordered pairs you found for the y-intercept, x-intercepts and vertex on the student worksheet in question #2a.

Follow the same procedure to fill out the rest of the worksheet.

Assessment and evaluation

- Following the activity, students should fill out the *Checking for Understanding* page on their own and submit to the teacher. Results from these submissions will allow the teacher to see which students need additional coaching on the concepts covered.
- Answers to Student worksheet provided in separate document. See ***Exploring Quadratics in Factored Form_Solutions***

Activity extensions

- Students can extend their understanding by exploring equations of the form $y = a(x - r)(x - s)$ where the “a” value takes on a variety of values.

**Student TI-Nspire Document**

- See ***Exploring Quadratics in Factored Form_Student*** and ***Exploring Quadratics in Factored Form_Solutions***