

TI-Nspire Activity: The Factor Connection

Activity Overview

In this activity, students will explore the connection between linear factors and quadratic functions. Transformations of quadratic functions will be used to develop and enhance the connection between factors, zeros, and graphs. It will make full use of the dynamic ability to manipulate graphs to make the connections in ways not possible on a TI-84.

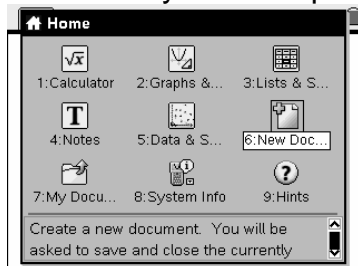
Concepts

Linear Factors
Quadratic Functions
Transformations

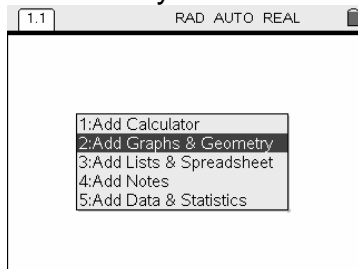
The Classroom

Directions:

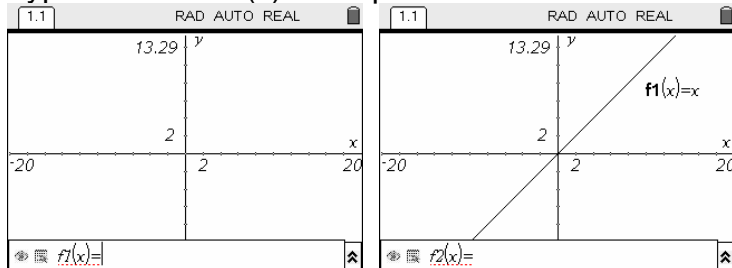
1. Turn on your TI-Nspire™ handheld and create a new document.



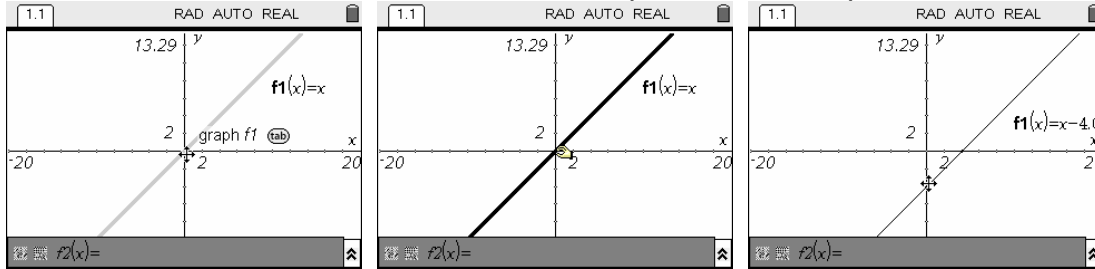
2. Click anywhere on the screen and select 2: Graphs and Geometry.



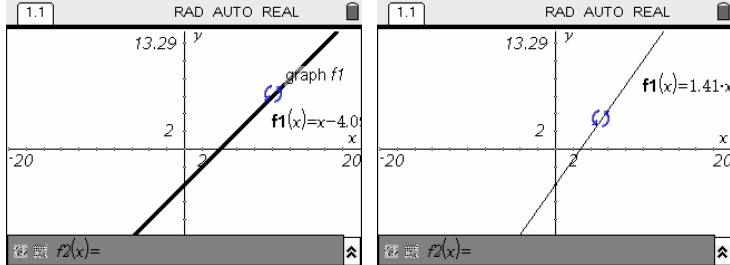
3. The cursor should be flashing in the function entry line at the bottom of the screen. Type in x after $f1(x)=$ and press ENTER. This will create a graph of the linear function.



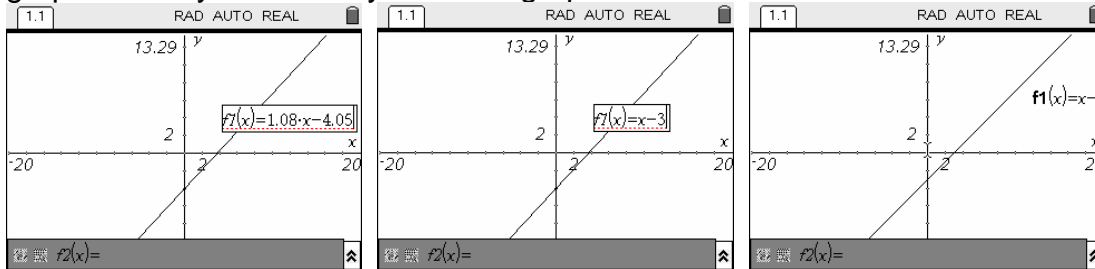
4. Press ESC to move your cursor to the graph screen. Move your cursor to a location near the line at its y-intercept. The cursor should look like a plus sign and the line should flash. Press and hold the button in the center of the “doughnut” until you grab the line (alternatively you can press CTRL then the center of the doughnut). Now when you move the cursor the line will move and its equation will be updated.



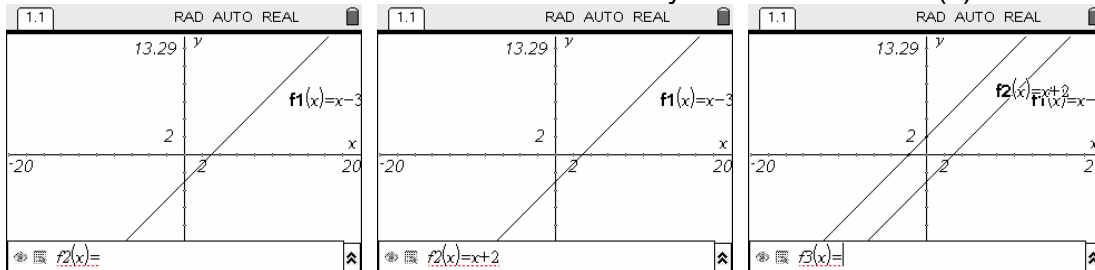
5. Press ESC to let go of the line. Now move the cursor to another location on the line away from the y-axis. The cursor will look like two circular arrows. Grab the line as described above and move it. This will change the slope of the line.



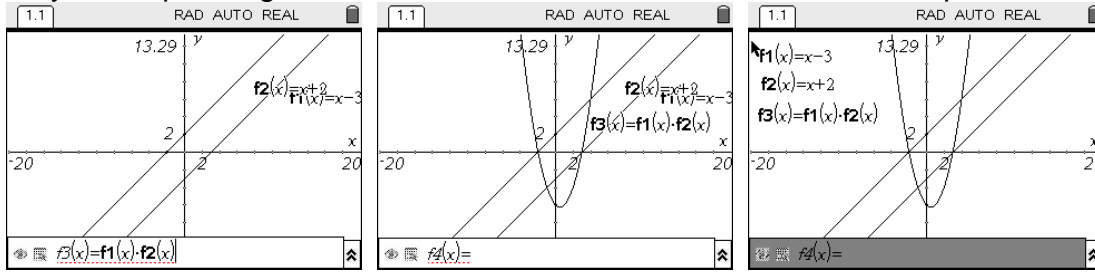
6. Now click on the function definition for f1 so you can edit the equation. Clear out the equation and type in $x - 3$ to change the graph using the algebraic definition. The interesting thing about TI-Nspire is that you can manipulate in multiple directions, graphical to symbolic or symbolic to graphical.



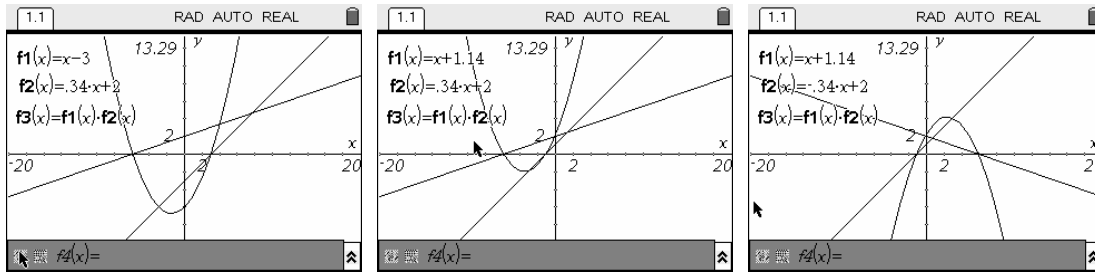
7. Press TAB to move back to the function entry line and define f2(x) as $x + 2$.



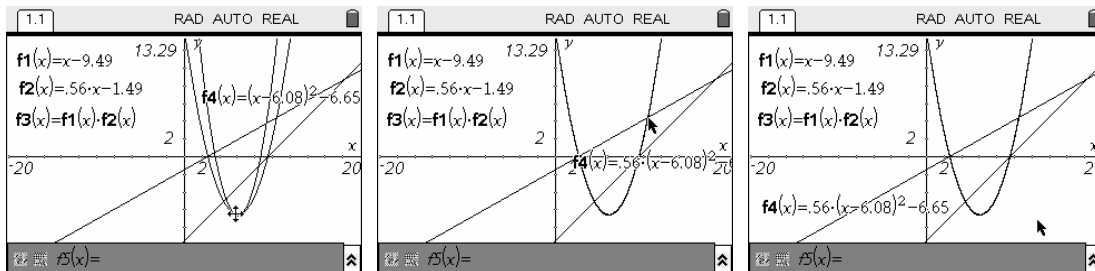
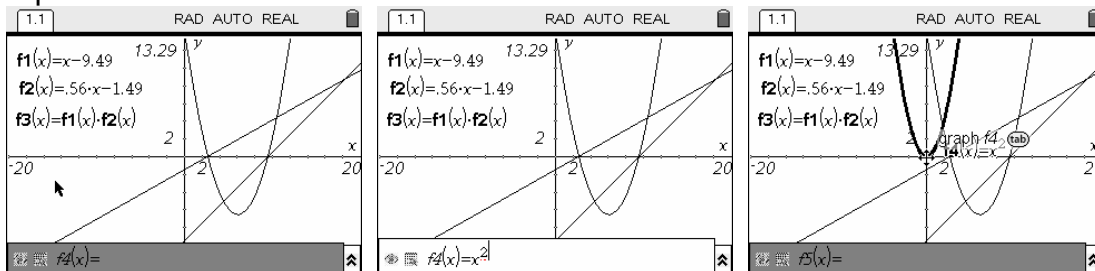
8. Next define $f_3(x)$ as the product of $f_1(x)$ and $f_2(x)$ and press ENTER. At this point, it may be helpful to grab the function labels and move them to the top left of the screen.



9. Now grab one of the lines and move it. Explore what happens to f_3 as f_1 and f_2 move.



10. Move the lines until you get a “nice” graph of f_3 (i.e. one you can see on the screen). Press TAB to get back to the function entry line. Since this graph is a quadratic equation, enter x^2 in f_4 . Once f_4 is defined as x^2 we can grab its graph and move it to match the graph generated by the product of f_1 and f_2 . This will help determine the equation of f_3 .



Extensions:

#1. Using Computer Algebra or manual computation, expand the product of **f1** and **f2**. Compare that to the expansion of **f4**. While there may be slight differences, the results should be close to one another. Discuss the importance of the factored, vertex, and standard forms of a parabola. This provides an opportunity to explore when each form is appropriate and what information is conveyed by each?

#2. Create a new document or problem and graph three lines. Compute the product of all three lines to investigate the relationship between linear factors and the zeros of a cubic polynomial. While the graph of x^3 cannot be manipulated as the graph of x^2 was you may try to match the graph with the expansion of the linear factors if Computer Algebra is available. Explore the similarities and differences between the quadratic and cubic polynomials generated.