Factoring Quadratics Given the Graph of f(x)
Teacher Notes

I usually introduce factoring quadratic polynomials using the graphs of the functions themselves. I try to do this to provide some sort of meaning or purpose behind the procedure.

The accompanying activity is designed to do just this. It uses dynamic sliders for the coefficients *a*, *b*, and *c*, and restricts them so all values for *a*, *b*, and *c* come from the set of integers on the interval [-5,5].
(Note: This restricts the activity to a finite number of possible factoring situations. It should be discussed with the students that there are an infinite number of such situations if the domain for *a*, *b*, and *c* are not restricted).

Activity Directions

This activity can be used as a demo by the teacher using the TI-Nspire Teacher Edition Computer Software, or by students using handhelds (perhaps in addition to the teacher demonstration).

Step 1:
Direct the students to change the values of *b*, and *c* in the top frame of page 1.2. The students should observe that the graph changes dynamically according to the values of the coefficients entered. On this screen, the two numbers on the bottom, *z1* and *z2*, represent the values of the two zeros (or *x*-intercepts) of the function.

It should be noted to the students that while the two functions f1(x) and f2(x) produce the same graph, the expression for f2(x) is only considered to be factored if z1 and z2 are integers.

Have students play with the sliders for *b* and *c* to change the graph according to a number of quadratics of your choosing (remember that *a*, *b*, and *c* are restricted to integers in [-5,5]). Then ask the students to write the polynomial.

Step 2 (which can easily be done on a different day):
The 2nd phase of this activity would be to consider factoring quadratics that have a lead coefficient other than 1.

You may have to lead the students in the direction of now changing the values of all 3 sliders - a, b, and c. Ask them to find situations where the values of z1 and z2 appear to be rational numbers.

What could one of the factors be if the zero, or x-intercept, has a value of 2.5?

New to version 1.7!
How do you determine if a value is a rational number? On page 1.3, a calculator application has been added. The students can check to see if a value for z1 and/or z2 appear to be rational numbers by accessing the "Approximate to Fraction" option (Menu > Number > Approximate to Fraction).

Note: After playing with some of the possibilities, it is recommended to change the value of the input to the approxFraction() function to 5E-4, from the given 5E-14, as shown below. It would lead to a good discussion with the students that this function is just what it says…an approximation. You may want to discuss with your students that "good" or "pretty fractions mean that z1 (or z2) are rational, while other fractions mean that the number is actually irrational.
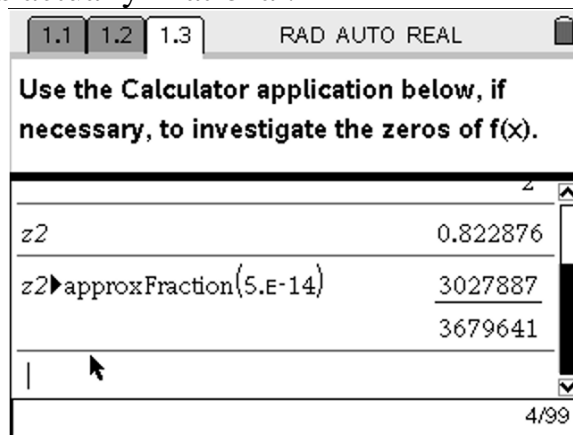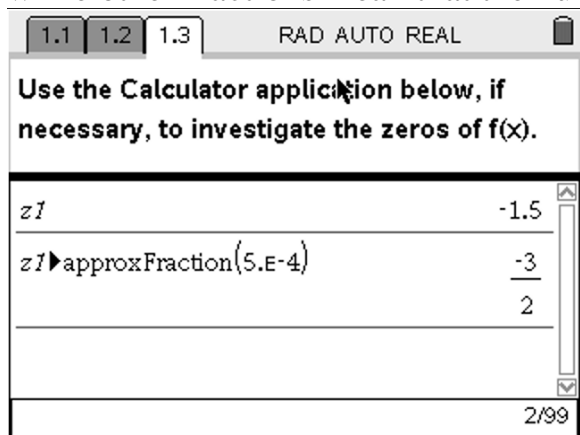
Not sure what I mean by this, just look at the following command…

$\pi \blacktriangleright \text{approxFraction}(5.\text{E-}14)$ $\quad \dfrac{5419351}{1725033}$