

Factoring Quadratics on the Graphing Calculator

Lesson Plan

Objective

The students will be able to factor a quadratic equation using the graph function of the CFX-9850G+ graphing calculator.

Engage

Discuss with students what the graph of a quadratic equation looks like. Discuss what it means when the graphs intersects with the x-axis and relate this to solving quadratic equations.

Explore

1. Using the calculator, model how to set up the graph window of the calculator.
2. Demonstrate to enter equations into **Y:** of the **Graph Menu**.
3. Demonstrate how to use the **G-Solve Function** to find the roots of a quadratic equation.
4. Demonstrate how to the **G-Solve Function** to find the minimum and maximum values of the graph of a quadratic equation when the root cannot be found.

Explain

Students will enter various quadratic functions and find the real roots using the graph of the quadratic equation.

Evaluate

The student will be able to graph a quadratic equation and determine its real roots.

Extensions

1. Have the students find the factors of a third degree equation.
2. Have students graph quadratic equations that do not have real roots and explain why using the graph of the equation.

Student Activity: Factoring Quadratics by Graphing

Objective:

Given a quadratic equation, the student will be able to find the real roots using a graphing calculator.

Introduction:

Solutions to an equation are values that, when substituted back into the equation, will result in a true statement. A quadratic is a relationship that relates to a second degree equation which is formed by multiplying two factors. Each quadratic has, at the most, two real solutions. In this activity you will graph various quadratic functions and find the real roots by using the functions of the graphing calculator and then rewrite the roots as factors.

Materials:

- Tables of Quadratic Equations
- Graphing Calculator

Questions:

- Using the graphing calculator, find the real roots for each of the given equations.

Quadratic	Real Roots	Factors
$y = x^2 + x - 6$		
$y = x^2 - 6x + 5$		
$y = 10 - 3x - x^2$		

Describe the points where the graph intersects the x-axis. _____

Would it be easier to find the factors using the graph or by hand? _____
Why? _____

- Using the graphing calculator, find the real roots for each of the given equations.

Quadratic	Real Roots	Factors
$y = x^2 - 9$		
$y = 81 - x^2$		
$y = x^2 + 10x + 25$		

Describe the points where the graph intersects the x-axis. _____

Would it be easier to find the factors using the graph or by hand? _____
Why? _____

3. Using the graphing calculator, find the real roots for each of the given equations.

Quadratic	Real Roots	Factors
$y = 2x^2 + 9x - 5$		
$y = 12 - 23x + 5x^2$		
$y = 15 + 26x + 8x^2$		

Describe the points where the graph intersects the x-axis. _____

Would it be easier to find the factors using the graph or by hand? _____

Why? _____

What other function could be used to find the factors other than G-Solve? _____

4. Using the graphing calculator, find the real roots for each of the given equations.

Quadratic	Real Roots	Factors
$y = x^2 - \frac{3}{10}x - \frac{1}{10}$		
$y = x^2 - \frac{1}{25}$		
$y = x^2 + \frac{14}{15}x + \frac{3}{15}$		
$y = x^2 - \frac{9}{16}$		

Describe the points where the graph intersects the x-axis. _____

Would it be easier to find the factors using the graph or by hand? _____

Why? _____

What other function could be used to find the factors other than G-Solve? _____

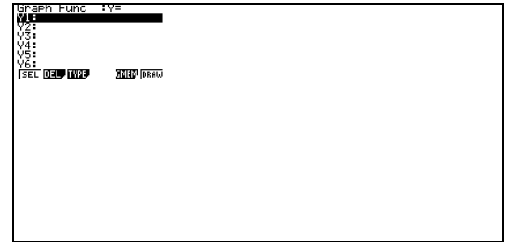
5. Using the graphing calculator, find the real roots for each of the given equations.

Quadratic	Real Roots	Factors
$y = x^2 + \frac{14}{15}x + \frac{3}{15}$		
$y = x^2 + \frac{4}{3}x + \frac{4}{9}$		
$y = \frac{9}{16} - \frac{3}{2}x + x^2$		
$y = -\frac{9}{64} - \frac{3}{4}x + x^2$		

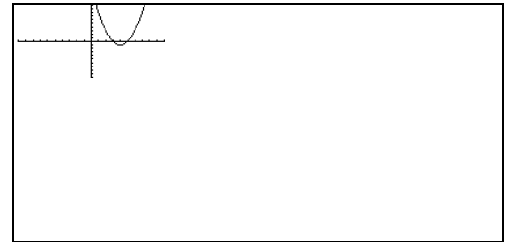
When using the graphing calculator, what function would you need to use in order to find the factors for these quadratics? _____

Calculator Notes

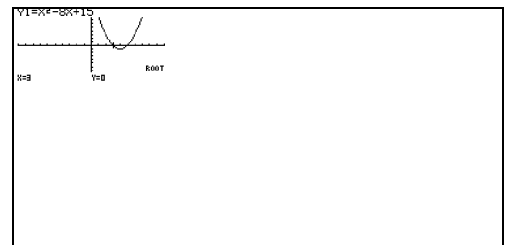
1. Turn on the calculator, go to the GRAPH Menu and press **EXE**. The screen should look like the one on the right.



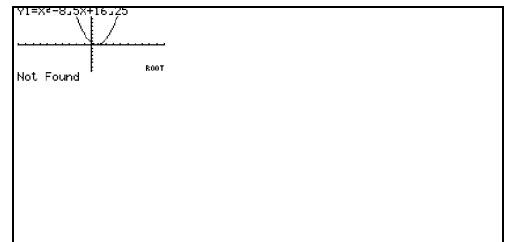
2. To make sure that the View Window is set up for graphing the equations, press **Shift F3** and **F3** again. Then press **EXE**. The calculator is ready to graph the equations. The screen at the right shows the equation $y = x^2 - 8x + 15$ being graphed.



3. To find the roots of this equation, press **Shift F5** and **F1**. The calculator will display the lefthand root first as shown on the screen to the right. One of the roots is $x = 3$ and the factor would be $(x - 3)$. To get to the other root, press the Right Arrow key.



4. In some cases, due to pixel resolution, the root will not be found using Root in the G-Solve Function. This happens when the quadratic is a perfect square involving a fraction. The screen at the right shows what happens when you try to find the root for the equation $y = x^2 - \frac{8}{5}x + \frac{16}{25}$.



5. Since the equation above opens upwards, it has a minimum value. Use G-Solve and **F3** to find the minimum value. This will give you the roots as shown in the screen to the right. The value of x can be rounded to get $x = .8$ and the root would be $(x - .8)$ which is $(x - \frac{4}{5})$ as a fraction.

