

Activity 8

Solving Equations by Graphing

TEACHER NOTES

Topic Area: Algebra

NCTM Standard: Represent and analyze mathematical situations and structures using algebraic symbols

Objective: The student will be able to utilize the Casio fx-9750G Plus calculator to solve equations and describe their graphing characteristics in the various activities included in this unit.

Introduction: Most low-achieving math students find it impossible to factor equations and then find the roots. The Casio fx-9750G Plus calculator makes it easy for these students by skipping the factor step and go straight to the root(s) or solution(s). This activity will also describe the characteristics of the equation and how the parts of the equation affect the graph. Absolute value functions will also be included in this activity.

The students should know the following vocabulary terms:

Absolute value function
Factoring a polynomial
Parabola
Quadratic Equation
Root
Solution of a polynomial
Transformation
Vertex

Calculator Notes for Activity 8

Objective: The student will be able to utilize the Casio fx-9750G Plus calculator to solve polynomial equations and describe their graphing characteristics in the various activities included in this unit.

Steps for Solving Polynomial Equations

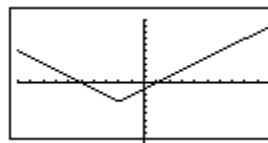
1. This activity has two goals. The first goal is to show you how to solve equations using the graphing capabilities of the Casio fx-9750G Plus and the second goal is to show you how to recognize the characteristics of the transformations of the graph. We will start with an absolute value function. Graph the following equation:

$$y = |x + 2| - 3$$

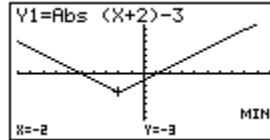
To graph this, start by turning your calculator on and use the arrow keys to highlight the **GRAPH** Menu and press **EXE**. Delete any old equations in the calculator and set the view window to **STD** (See activity 6 for steps). To get the absolute value, press the **OPTN** Key, press **F5** (NUM), press **F1** (Abs). This writes Abs on the screen of your calculator and tells the calculator to change parenthesis to function as absolute values. Press (, then press the x, q, T key, press +, 2,), -, 3, and **EXE**. Your screen should look like the following.



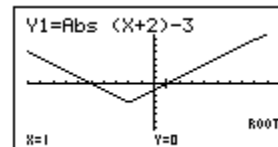
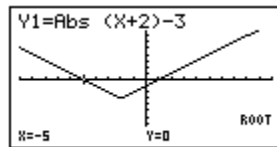
Graph this equation by pressing **F6** (DRAW).



To find the vertex of this graph, press **SHIFT**, **F5** (G-Solv), then press **F3** (MIN) since the vertex is the lowest or minimum of the graph.



The bottom of the screen gives you the coordinates of the vertex, $(-2, -3)$. Look at the original equation and the vertex, do you notice any similarities? Press **F5**, again. This time press **F1** (ROOT) which will give us the x-intercepts or solutions of the equation. After you get the first x-intercept, notice the graph crosses the x-axis a second time to the right of the first x-intercept. To get the second x-intercept, or second solution, use the arrow key that points to the right.

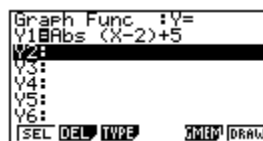


The two x-intercepts are at the bottom of the two screens, $(-5, 0)$ and $(1, 0)$. Therefore, $x = -5$ and 1 .

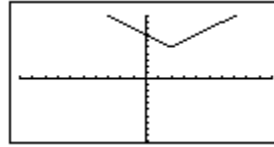
Graph the following absolute value equation. Find the vertex and the x-intercepts or solutions.

$$y = |x - 2| + 5$$

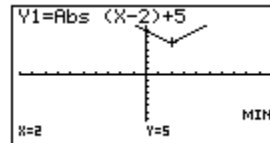
Start by pressing **EXIT** to get back to the equation. Delete the old equation by pressing **F2**, then **F1**, and enter the new one by pressing **OPTN**, **F5**, then **F1** to write **Abs** to the screen. Now press $($, then press the x, q, T key, press $-$, 2 , $)$, $+$, 5 , and **EXE**. Your screen should look like the following.



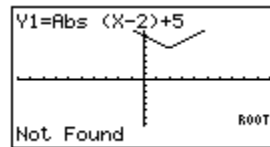
Graph this equation by pressing **F6** (DRAW).



Find the vertex by pressing **F5** (G-Solv). Since the vertex is the lowest point of the graph, or minimum, press **F3** (MIN).



Did you predict the vertex to be (2, 5) from the equation? Now, find the x-intercepts, or solutions of the equation by pressing **F5**, then press **F1** (ROOT).



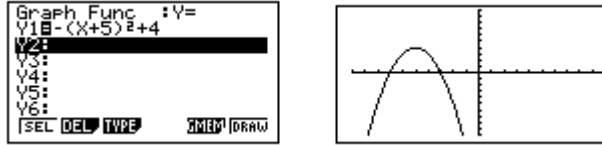
The graph never crosses the x-axis which is why the calculator tells you that the x-intercept is **Not Found**. In other words, there is no solution to this equation.

2. We will now calculate the vertex and find the solutions of a quadratic equation or parabola. Graph the following equation.

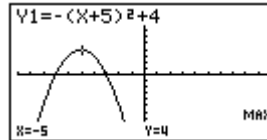
$$y = (x - 7)^2 - 1$$

Use the same method as Step 1. To graph this, start by turning your calculator on and use the arrow keys to highlight the **GRAPH** Menu and press **EXE**. Delete any old equations in the calculator and set the view window to **STD**. Press (, then press the x, θ, T key, press -, 7,), x^2 , -, 1, and **EXE**.

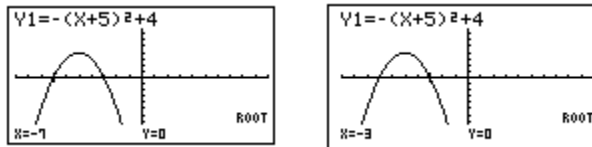
Press **EXIT** to get back to the equation screen. Delete the old equation by pressing **F2**, and then press **F1**. Press -, (, then press the x, q, T key, press +, 5,), x^2 , +, 4, and **EXE**. To graph, press **F6**.



Notice that the parabola is upside-down. This is caused by the negative sign in front of the parenthesis. When you look for the vertex, you will need to press **MAX** instead of **MIN** because the vertex on this parabola is the highest or maximum point. Find the vertex by pressing **F5**, and then press **F2** (**MAX**).



The vertex is at the coordinate $(-5, 4)$. Were you able to predict the vertex? Solve for x by finding the x -intercepts. You will need to find two solutions since the parabola crosses the x -axis in two places.



The x -intercepts, or roots, are $(-7, 0)$ and $(-3, 0)$. Therefore the solutions of the equation are $x = -7$ and -3 .

3. When you are asked to solve an equation by **FACTORING**, you are asked to work through a series of equivalent algebraic equations to determine the same answer you just found by finding the x -intercepts or roots.

Name _____ Class _____ Date _____

Activity 8: Worksheet Solving Equations by Graphing

Graph the following equations, find the vertex and solve for x.

1. $y = |x - 2| - 6$

2. $y = -|x + 5| + 2$

3. $y = |2x - 3| - 4$

4. $y = |x + 4| + 3$

5. $y = (x + 3)^2 - 5$

6. $y = -(x - 4)^2 + 1$

7. $y = -(x + 2)^2 + 8$

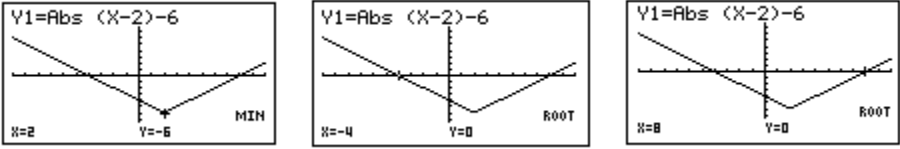
8. $y = (x + 3)^2 + 6$

Solve by factoring.

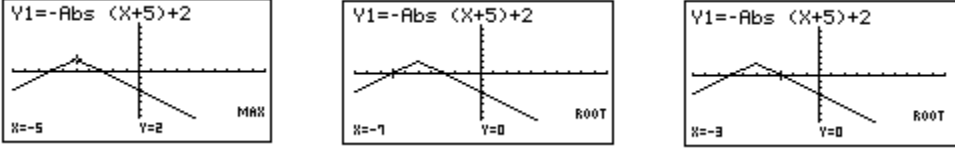
9. $y = x^2 + 5x + 6$

10. $y = x^2 - 7x + 10$

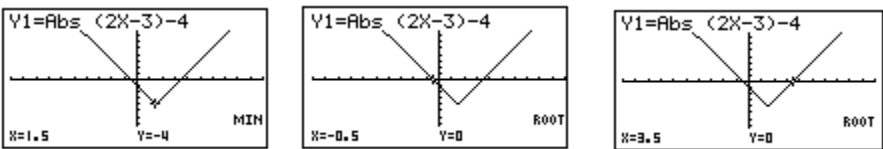
Solutions to Activity 8 Worksheet

1. 

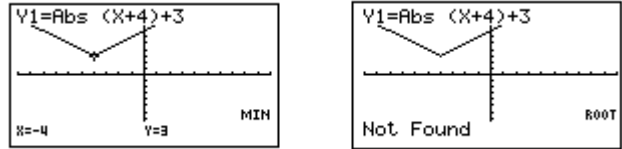
Vertex = (2, -6); Solutions are $x = -4$ and 8 .

2. 

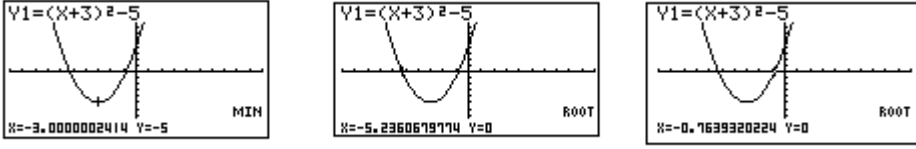
Vertex = (-5, 2); Solutions are $x = -7$ and -3 .

3. 

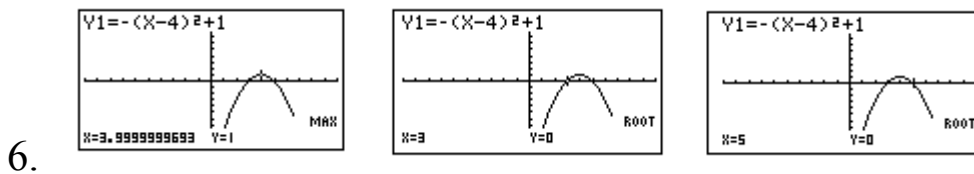
Vertex = (1.5, -4); Solutions are $x = -0.5$ and 3.5 .

4. 

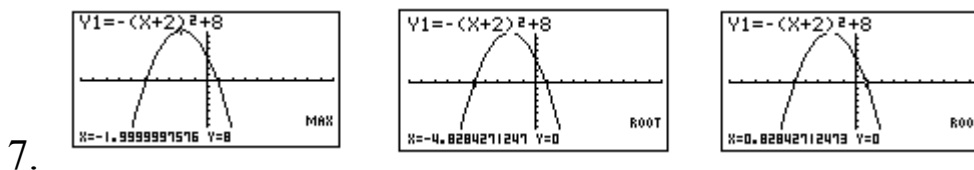
Vertex = (-4, 3); No solutions for x .

5. 

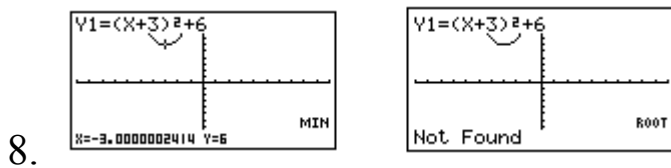
Vertex = (-3, -5); solutions are $x = -5.2360679774$ and -0.7639320224 .



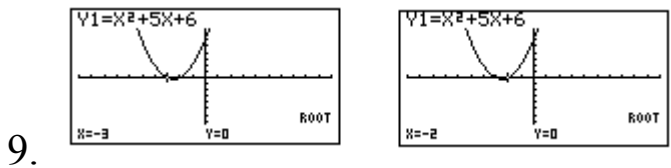
Vertex = (4, 1); solutions are $x = 3$ and 5 .



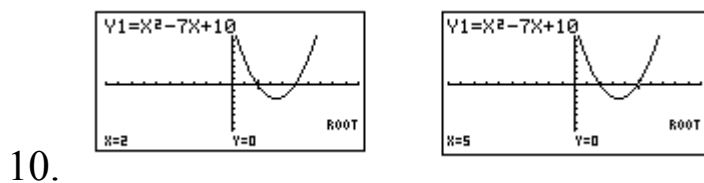
Vertex = (-2, 8); solutions are $x = -4.8284271247$ and 0.82842712473 .



Vertex = (-3, 6); no solutions for x .



Solutions are $x = -3$ and -2 .



Solutions are $x = 2$ and 5 .