EXPLORATIONS

Activity 6

The Standard Form of a Quadratic Equation

The standard form of a quadratic equation is $y = ax^2 + bx + c$. This form can be factored into two linear factors and the factors can be used to determine the zeros or x-intercepts of the equation. The y-intercept and vertex can also be determined from the graph.

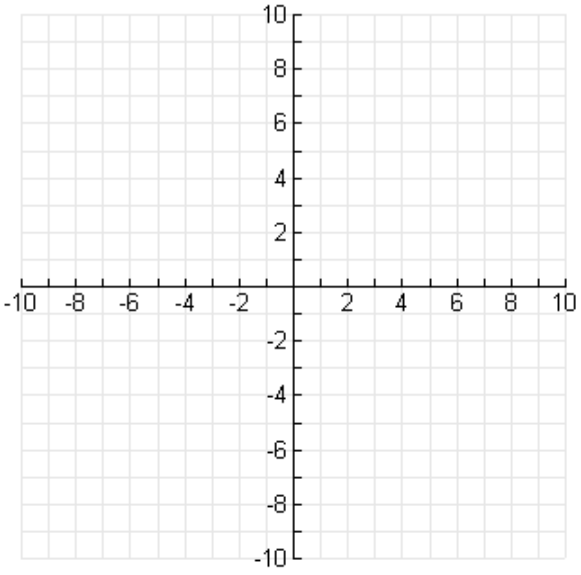
In this activity, you will explore how the zeros, y-intercept and vertex are related to the graph of the standard form of a quadratic function.

Exploration

1. Open a new TI InterActive! document. Title this document **Standard Form of a Quadratic Function**. Add your name and the date to this document.
2. Select Graph  and define y1(x): = $x^2 + 2x - 8$.

   ***Note**: Use the symbol palette*  *to access the* ^{2}.

1. Click in the checkbox at the left of $y1(x)$ to select the equation.
2. Sketch the graph on the grid provided.



Analysis

1. Click on Trace. Trace along the graph and determine the values of x for which the y-value is zero. These are called the x-intercepts. Record the x-intercepts.

   _____

2. What is the significance of these points on the graph?

   _____

3. Trace along the graph and determine the value of y for which the x-value is zero. This is called the y-intercept. Record the y-intercept.

   _____

4. What is the significance of this point on the graph?

   _____

5. Trace along the graph and determine the smallest value for y. This point is called the vertex. Record the point. Close the Trace Value dialog box by clicking on Cancel.

   _____

6. In the Graph window click on Table then Table Setup  . Change Independent Mode to Ask. Click on OK to close Table Setup. Find the value of $y = x^2 + 2x - 8$ for each value below by entering each x-value in the x column of the function table.

x	y1(x) $x^2 + 2x - 8$
-4	
-1	
0	
2	

7. Click on Save to Document  in the Function Table dialog box to paste the table into your TI InterActive! Document. In the Graph window, click on Save to Document  to paste the graph into your TI InterActive! document.

8. Select Math box  . Find the zeros of the expression by selecting **Math▶Algebra▶Zeros** on the Math Palette and then typing **$x^2 + 2x - 8$, x)**. Record the zeros.

_____

9. Select Math box  . Find the factors of the expression by selecting **Math▶Algebra▶Factor** on the Math Palette and then typing **$x^2 + 2x - 8$, x)**. Record the factors.

_____

10. The factors are of the form $(x - a) * (x - b)$. What must be true of one of the factors in order for their product to be zero?

_____

_____

11. Select Math box  . Find the zeros of each factor by selecting **Math▶Algebra▶Zeros** on the Math Palette and then typing ***your factor*, x)**. Record the zeros.

_____

12. How do the zeros of each factor compare to the zeros of the function?

_____

13. How do the zeros of the function and the x-intercepts compare?

_____

14. Explain how to find the x-intercepts of a quadratic equation without graphing the equation.

_____

_____

15. How does the value of $x^2 + 2x - 8$ compare to the y-intercept when $x = 0$?

_____

_____

16. How can the vertex be determined from the graph?

_____

17. Save this document as **standard_form.tii**. Print a copy of this document.

Additional Exercises

For each problem, graph each and label the *x*-intercepts, *y*-intercept and the vertex. Then determine the zeros of each, the factors, the value of y when $x = 0$ and the minimum value for *y*.

1. $y = x^2 + 4x + 3$

   Zeros: _____

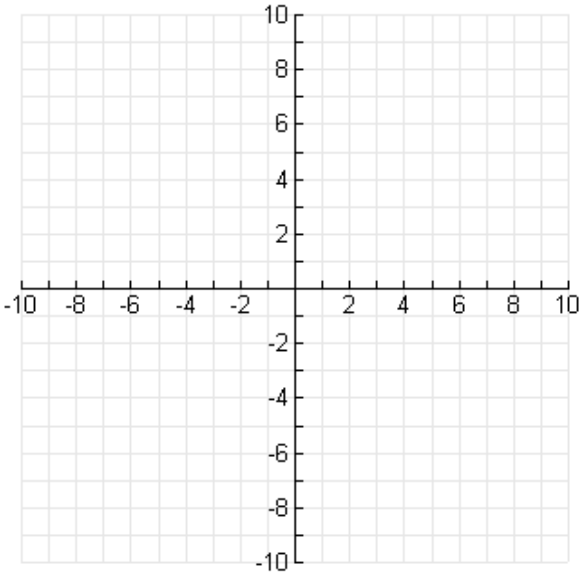
   Factors: _____

   x-intercepts: _____

   $x = 0$, $y =$ _____

   y-intercept: _____

   Vertex: _____



2. $y = 2x^2 - 10x + 8$

   Zeros: _____

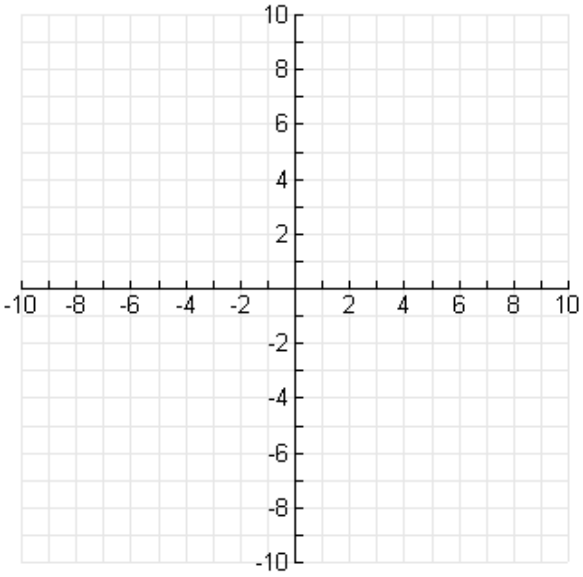
   Factors: _____

   x-intercepts: _____

   $x = 0$, $y =$ _____

   y-intercept: _____

   Vertex: _____



3. $y = 6x^2 + 3x - 3$

   Zeros: _____

   Factors: _____

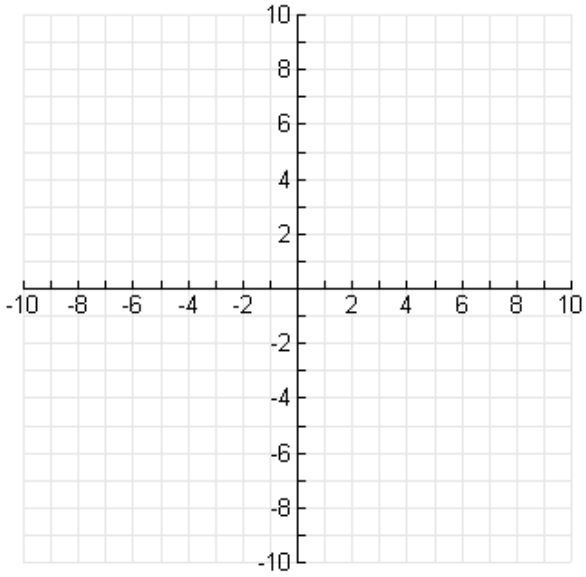
   x-intercepts: _____

   $x = 0$, $y =$ _____

   y-intercept: _____

   Vertex: _____

   Hint: *Change the Trace Step to 0.01.*



4. Generalize your findings about the factors, zeros and x-intercepts.

   _____

   _____

5. Generalize your findings about the the y-intercept and the value of y when $x = 0$.

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   _____

6. Generalize your findings about the minimum value of y and the vertex.

   _____

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