

Name: _____

From Factored to Standard Form

This is the equation of a parabola, in *standard form*: $y = ax^2 + bx + c$. The important points of the function are sometimes more difficult to see in this form, but they can be found using your knowledge of factored form.

0. Recall:

Factored Form of a quadratic function looks like

$$y = a(x - p)(x - q)$$

In terms of a, p, and q,

The x-intercepts (the roots) are:

The y-intercept is:

The x-coordinate of the vertex is:

- Given the function $y = 2x^2 - 2x - 24$,
 - Find the roots (by factoring).
 - Find the y-intercept.
 - Find the coordinates of the vertex.
 - Find the sum and product of the roots. (You will see why this is useful later.)
- Take the equation $y = a(x - p)(x - q)$, and distribute, so as to write it in standard form. [Hint: this is a two-step process. First multiply $a(x - p)$. Then multiply the product by $(x - q)$.]
- Write formulas for b and c in terms of a, p, and q.
- Generalize for any quadratic in standard form:

Standard form of a quadratic function looks like:

$$y = ax^2 + bx + c$$

In terms of a, b, and c,

The y-intercept is:

The sum of the roots is:

The product of the roots is:

The x-coordinate of the vertex is:

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Using Factored and Standard Form

For the quadratic equations listed below, find:

- a. the y-intercept
- b. the roots (by factoring)
- c. the sum and product of the roots (with your formulas)
- d. the x-coordinate of the vertex (how is it related to the sum of the roots?)
- e. the y-coordinate of the vertex
- f. use a-e to graph the parabola accurately, on graph paper
- g. check your answers, using your graphing calculator

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

2. $y = 5x^2 - 35x + 60$

3. $y = -3x^2 - 18x - 24$

4. $y = 2x^2 - 4x - 6$

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

6. $y = 4x^2 - 1$

Discussion

7. Do all parabolas have a y-intercept?
8. Do all parabolas have x-intercepts?
9. Do all parabolas have a vertex?
10. Does the formula for the x-coordinate of the vertex work when there are no x-intercepts?