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:

1. Given the function $y = 2x^2 - 2x - 24$,
   a. Find the roots (by factoring).
   b. Find the y-intercept.
   c. Find the coordinates of the vertex.
   d. Find the sum and product of the roots. (You will see why this is useful later.)

2. 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 $(x - q)$.]

3. Write formulas for b and c in terms of a, p, and q.

4. 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?