Examples of Quadratic Function Forms

Example *Find the vertex and sketch a graph of* $y = 2x^2 - 12x + 10$.

Solution *We must change from Standard Form to Vertex Form. Here's how to use completing the square:*
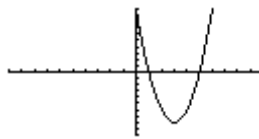
$$y = 2x^2 - 12x + 10$$
$$y = 2(x^2 - 6x) + 10$$
$$y = 2(x^2 - 6x + 9) + 10 - 2 \cdot 9$$
$$y = 2(x - 3)^2 + 10 - 18$$
$$y = 2(x - 3)^2 - 8$$

This form shows that the graph of the parabola has a vertex at $(3, -8)$. *Since the coefficient of* x^2 *is positive, the parabola opens upward. Its y-intercept is* 10. *Here's a screen shot from the calculator in a zoom standard setting:*

Example *A quadratic function has x-intercepts* -3 *and* 4, *and y-intercept* 8. *Find a formula for this function in* **Factored Form**.

Solution *Since the x-intercepts are give, we can set up the Factored Form*

$$y = a(x + 3)(x - 4)$$

In this case, we need to find the number a. Since we know another point on the graph, $(0, 8)$, *we will substitute* $x = 0$ *and* $y = 8$.

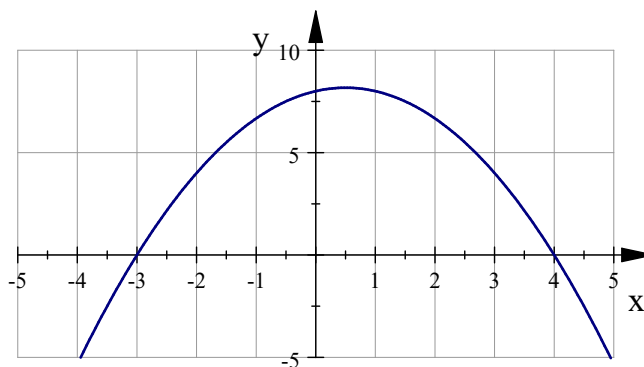$$8 = a(0 + 3)(0 - 4)$$
$$8 = -12a$$
$$a = -\frac{8}{12}$$
$$a = -\frac{2}{3}$$

and write the function

$$y = -\frac{2}{3}(x + 3)(x - 4)$$

Here's a graph that shows the given intercepts:

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Example *A quadratic function's graph has vertex* $(-2,-3)$ *and y-intercept 5. Find the symbolic representation of this function in* **Standard Form**.

Solution *We begin by writing a formula in Vertex Form*

$$y = a(x+2)^2 - 3$$

To find the leading coefficient a we use the point $(0,5)$

$$5 = a(0+2)^2 - 3$$
$$5 = 4a - 3$$
$$a = 2$$

We can now write the Vertex Form equation

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

It remains to change this to Standard Form

$$y = 2(x^2 + 4x + 4) - 3$$
$$y = 2x^2 + 8x + 8 - 3$$
$$y = 2x^2 + 8x + 5$$