10.2 Quadratic Functions

Today, we're introducing bx to the equations, and our vertex will not be on the y-axis.

Finding the axis of symmetry and the vertex.

Use the formula $x = \frac{-b}{2a}$ to find the axis of symmetry.

Plug x into the quadratic equation to find the y-value of the vertex.

Try a few...

$y = 1x^2 - 6x + 9$

$x = -\frac{b}{2a}$

$x = \frac{6}{2(1)} = \frac{6}{2} = 3$

$x = 3$ is AoS

$y = 3^2 - 6(3) + 9$

$y = 9 - 18 + 9 = 0$

$(3, 0)$

$y = 2x^2 + 4x - 3$

$x = -\frac{b}{2a}$

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

$x = -1$ $\quad$ V: $(-1, -5)$

$y = 2(-1)^2 + 4(-1) - 3$

$y = 2 \cdot 1 + 4(-1) - 3$

$y = 2 - 4 - 3$

$y = -5$

$y = -3x^2 + 6x + 5$

$x = -\frac{b}{2a}$

$x = \frac{-6}{2(-3)} = \frac{-6}{-6} = 1$

$y = -3(1)^2 + 6(1) + 5$

$y = -3 + 6 + 5$

$y = 8$

AoS $x = 1$

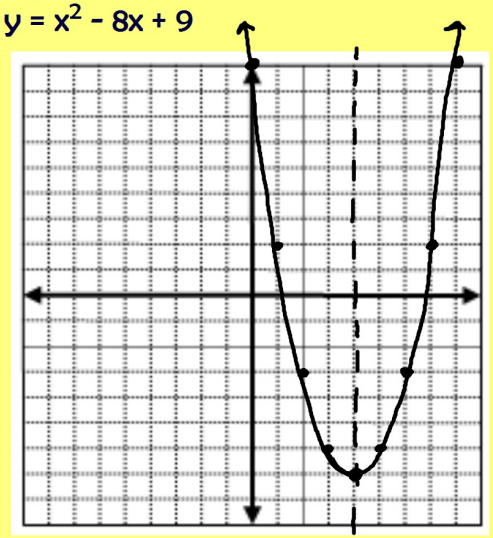
Vertex $(1, 8)$

At any point in the graphing process, you can plot the y-intercept. If you know the y-intercept, and the axis of symmetry, you can reflect the y-intercept and now you'll have 3 points graphed.

The last thing to do is to pick another x-value that's not on the y-axis or the axis of symmetry. Count how far away it is from the vertex in the x direction, and plug it into ax^2 and move that far away from the vertex in the y-direction. Reflect that point over the axis of symmetry and you have the 5 points for the parabola.

Try some...

$y = x^2 - 8x + 9$



$x = -\frac{b}{2a}$

$x = \frac{8}{2(1)} = \frac{8}{2} = 4$

AoS $x = 4$

$y = 4^2 - 8(4) + 9$

$y = 16 - 8(4) + 9$

$y = 16 - 32 + 9$

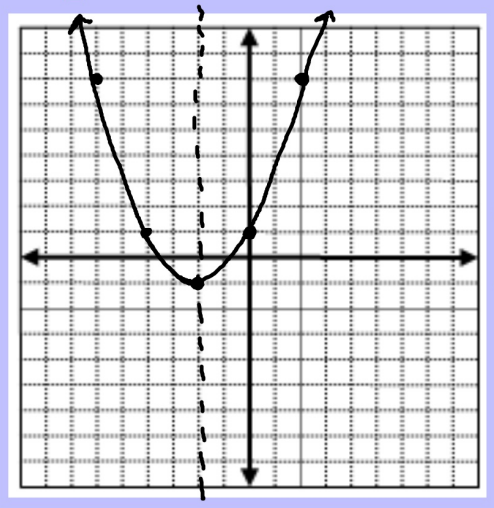
$y = -7$

Vertex $(4, -7)$

Try some...

$y = \frac{1}{2}x^2 + 2x + 1$

$\frac{1}{2}(2)^2$



$x = \frac{-b}{2a}$

$x = \frac{-2}{2(\frac{1}{2})} = \frac{-2}{1} = -2$

AoS $x = -2$

$y = \frac{1}{2}(-2)^2 + 2(-2) + 1$

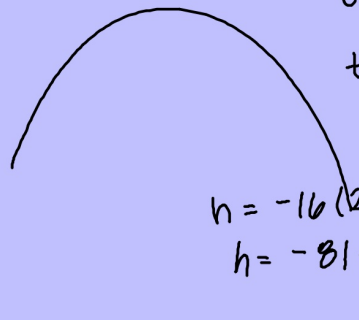
$y = \frac{1}{2}(4) + 2(-2) + 1$

$y = 2 - 4 + 1$

$y = -1$

Vertex $(-2, -1)$

Suppose a firework follows the parabolic path of $h = -16t^2 + 72t + 520$. Afterall, what goes up must come down, right? What is the maximum height this firework will reach in the Fourth of July sky?



$t = \frac{-b}{2a}$

$t = \frac{-72}{2(-16)} = \frac{-72}{-32} = 2.25$

$h = -16(2.25)^2 + 72(2.25) + 520$

$h = -81 + 162 + 520$

601 ft

homework:
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