The quadratic formula

Our final task is to apply everything that we have learned to quadratic relations in standard form $y = ax^2 + bx + c$ for any coefficients a, b and c.

Example – Determine the axis of symmetry, vertex and x-intercepts of $y = 3x^2 + 5x + 1$

Clearly, the process required to determine the x-intercepts of a quadratic relation from standard form is very tedious.

However, it will be the same process for every quadratic relation $y = ax^2 + bx + c$.

Therefore, we only need to complete the process once using a, b and c.

We can summarize the entire process into one formula for determining x-intercepts!

Our formula must accomplish two basic tasks:

1. Complete the square in order to convert from standard form into vertex form:

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

2. Apply opposite operations in order to determine the x-intercepts when y = 0:

$$a\left(x+\frac{b}{2a}\right)^2-\frac{b^2}{4a}+\frac{4ac}{4a}=0$$

Summary: The quadratic formula can be written as $x = -\frac{b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$

This formula takes a quadratic relation in standard form $y = ax^2 + bx + c$

and then completes the square and solves for x by opposite operations when y = 0

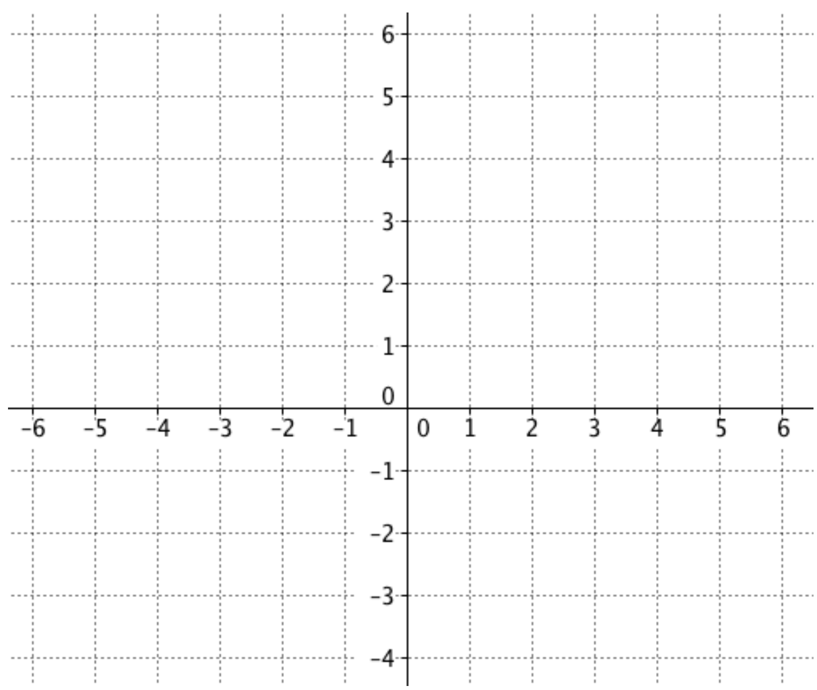
to find axis of symmetry $x =$ and x-intercepts $x_1 =$

$x_2 =$

Example – Determine the vertex and x-intercepts of $y = -0.8x^2 + 6x + 5$.

Homework – Please complete the questions below and #3abc on page 300.

1. Determine the vertex, x-intercepts and step pattern of the quadratic relation $y = -x^2 + 6x - 3$. Then graph the parabola on the grid below.



2. Determine the x-intercepts, vertex and equation of the axis of symmetry of the quadratic relation $y = -0.2x^2 - x + 3$. Then sketch the parabola and label the coordinates of all of the important points.