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|  | **Parabola**: a U-shaped curve.* All quadratic functions form parabolas.

**Standard Form of a Quadratic**: $ax^{2}+bx+c$* $ax^{2}$ is the quadratic term.
* $bx$ is the linear term.
* $c$ is the constant term.
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| Intercepts | **X-intercepts:** the x-coordinates of the points where the graph intersects the x-axis. * X-intercepts can be found by factoring and solving the equation for x.
* Not all quadratic functions have x-intercepts.

**Y-intercept:** the y-coordinate of the point where the graph intersects the y-axis. All quadratic functions have exactly 1 y-intercept.* **In standard form,** $c$ **is the y-intercept.**
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| The Discriminant | The **discriminant** helps us know whether a function has x-intercepts.* Discriminant formula: $b^{2}-4ac$
	+ If it’s negative, there are no x-intercepts.
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|  | The graph of $y=x^{2}-2x-4$ is shown below.* The y-intercept is $c$, or -4.

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| Vertex and Axis of Symmetry | The **vertex** of a parabola is the point where the graph changes direction. The **axis of symmetry** is the line through the vertex of a parabola. The parabola is symmetric about this line.* Axis of symmetry formula: $x=\frac{-b}{2a}$

In the graph above, the equation of the axis of symmetry is $x=1$ because the vertical line through 1 is the line that cuts the parabola in half. |
| The vertex **always** lies on the axis of symmetry.**To find the vertex from the equation,**1. Use the formula $x=\frac{-b}{2a}$to find the x-coordinate.
2. Substitute that number into the equation for x and solve for y to find the y-coordinate.
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| Maximum and Minimum | **The y-coordinate of the vertex is the maximum or minimum value.*** Maximum: the greatest y-value of a function
* Minimum: the least y-value of a function

In standard form, you can tell whether a function has a maximum or minimum by the sign of $a.$* If $a>0$, the parabola opens up and has a minimum value.
* If $a<0$, the parabola opens down and has a maximum value.

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| Guided Practice | 1. Find the y-intercept and vertex of the function $y=-2x^{2}+4x+3$. Determine whether the vertex is a minimum or maximum point on the graph.
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| 1. $y=2x^{2}-11x+5$ is a quadratic function. Determine the direction in which the function opens, the coordinates of the vertex, the axis of symmetry, the x-intercepts (if any), and the y-intercept.
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|  | 1. $y=2x^{2}+8x+8$ is a quadratic function. Determine the direction in which the function opens, the coordinates of the vertex, the axis of symmetry, the x-intercepts (if any), and the y-intercept.
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|  | 1. $y=-x^{2}+8x-17$ is a quadratic function. Determine the direction in which the function opens, the coordinates of the vertex, the axis of symmetry, the x-intercepts (if any), and the y-intercept.
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