

Unit 3. Section 1. Quadratic Functions

Standard Form of the Quadratic Equation

The **standard form** of a quadratic equation is $f(x) = ax^2 + bx + c$, $a \neq 0$.

Term	Name
ax^2	
bx	
c	

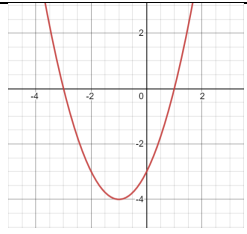
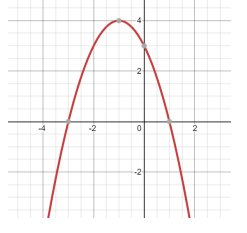
Note: In the standard form, we added the condition a is not equal to zero.

Question: What if a is equal to zero in the expression of f ?

$$f(x) =$$

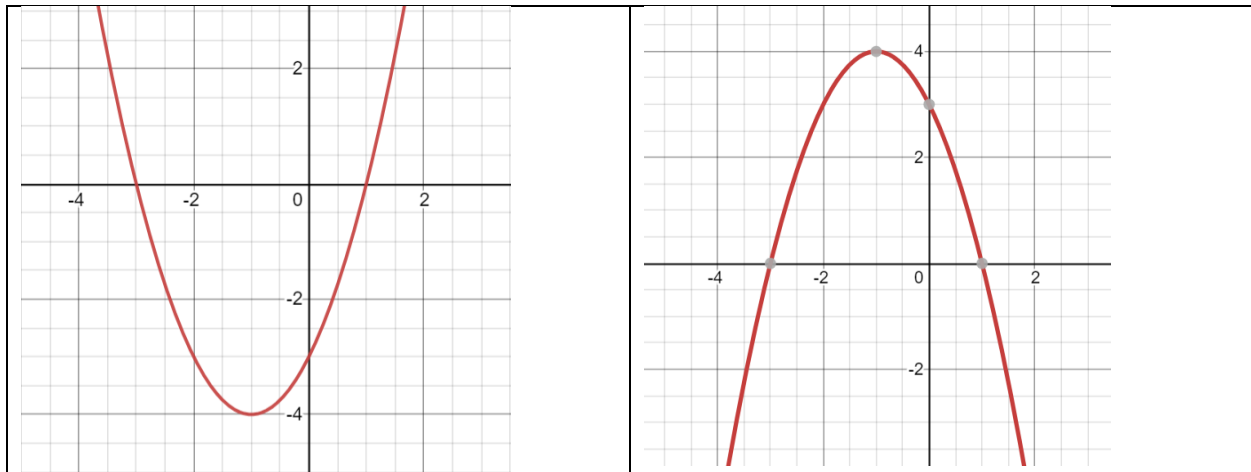
Then f is a _____ function.

Graph of a Quadratic Function

	Graph	Type
$a > 0$		The parabola opens _____
$a < 0$		The parabola opens _____

Vertex and axis of symmetry

Please mark the vertex and draw the line of symmetry.



The vertex is a point and has coordinates _____.

The axis of symmetry is a line with equation _____.

Practice #1 Use algebraic formulas to find the vertex and axis of symmetry for the following quadratic functions.

a) $f(x) = 2x^2 + 4x - 6$

b) $f(x) = -3x^2 + 5x - 2$

Vertex Form of Quadratic Functions

If the vertex has coordinates (h, k) , then the **vertex form** of the quadratic equation is $f(x) = a(x - h)^2 + k$.

Practice #2. Write the vertex form equation of a parabola with $a=-2$ and vertex $(1,4)$.

Extrema

A quadratic function has exactly one _____ extremum.

	Extremum Type
$a > 0$	
$a < 0$	

Zeros/x-intercepts

Graph	Number of zeros/x-intercepts	Zeros	x-intercepts
<p>A coordinate plane showing a downward-opening parabola. The x-axis is labeled from -4 to 2, and the y-axis from 0 to 4. The parabola crosses the x-axis at points labeled $(-3, 0)$ and $(1, 0)$.</p>			
<p>A coordinate plane showing an upward-opening parabola. The x-axis is labeled from 0 to 2, and the y-axis from 0 to 2. The parabola crosses the x-axis at a point labeled $(1, 0)$.</p>			
<p>A coordinate plane showing an upward-opening parabola. The x-axis is labeled from -2 to 4, and the y-axis from 0 to 4. The parabola is entirely above the x-axis and does not intersect it.</p>			