

Quadratic Functions 1 – Vertex and General Form

When you “**sketch**” a parabola, your sketch should show the general shape of the graph accurately, and label the key features including:

- the coordinates of x - and y -intercepts
- the coordinates of the vertex
- the equation of the axis of symmetry

Plot on your GDC. Then, sketch on your page.
State the domain and range.

$$f(x) = -0.5x^2 + 7.5x - 18 \text{ for } 2 \leq x \leq 14$$

Investigation: Vertex Form Quadratics

Graph each function below using Desmos. Then, complete the table.

$f(x) = a(x-h)^2 + k$	a	h	k	Up/ down	Axis of symmetry	Vertex
a $f(x) = 2(x+1)^2 - 4$						
b $f(x) = -\frac{1}{2}(x-2)^2 + 5$						
c $f(x) = -3(x-1)^2 - 6$						

Summary

A quadratic function written in the form $f(x) = a(x-h)^2 + k$, $a \neq 0$, is said to be in **vertex form**. The coordinates of the vertex are (h, k) and the equation of the axis of symmetry is $x = h$.

Practice

Write down the coordinates of the vertex and the equation of the axis of symmetry for each function:

a $f(x) = -3(x-4)^2 + 1$

b $f(x) = 2(x+3)^2 - 6$

Investigation: General Form Quadratics

Change each vertex form quadratic into **general form**. Then, fill the table below.

$$f(x) = ax^2 + bx + c$$

a $f(x) = 2(x+1)^2 - 4$

b $f(x) = -\frac{1}{2}(x-2)^2 + 5$

c $f(x) = -3(x-1)^2 - 6$

$f(x) = ax^2 + bx + c$	$-\frac{b}{2a}$	$f\left(-\frac{b}{2a}\right)$	Axis of symmetry	Vertex
a				
b				
c				

Summary

_____, $a \neq 0$, is called the _____ of the equation for a quadratic function.

The equation of the _____ is _____. The coordinates of the

_____ are _____ and the y-intercept is _____

Practice

Find the equation of the axis of symmetry, the coordinates of the vertex, and the y-intercept. Use these features of the graph of the quadratic and a point of symmetry to the y-intercept to sketch a graph.

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

b $f(x) = 2x^2 + 4x - 1$

Quadratic Functions 2 – Factored (Intercept) Form

A quadratic function which is written in the form _____
 $a \neq 0$, is said to be written in _____ form (or _____ form). The
coordinates of the x-intercepts of the graph are _____

Group Chat:

Note that the graph of $y = 0.5(x - 3)(x + 5)$

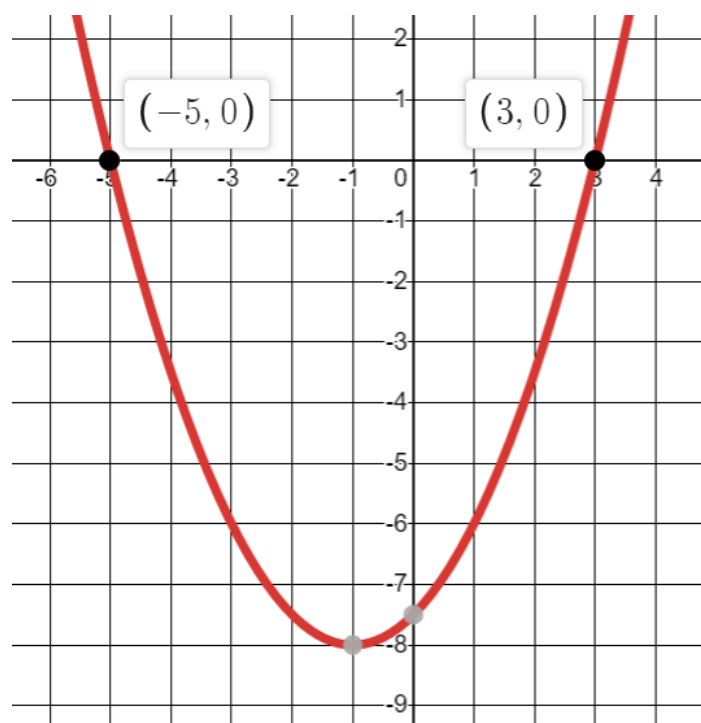
has x-intercepts as shown below.

What is the x-value of the vertex?

What is the equation of the axis of symmetry?

How does the location of the axis of symmetry relate to the two x-intercepts?

Create a general rule for finding the equation of the axis of symmetry from this form, using p and q.



Apply your Skills

Find the equation of the axis of symmetry and the coordinates of the x -intercepts, the y -intercept and the vertex. Use these features to sketch the graph of the parabola.

a $f(x) = (x - 4)(x - 2)$

b $f(x) = -2(x + 3)(x + 1)$

SUMMARY OF FORMS of QUADRATIC EQUATIONS:

Quadratic functions and their graphs		
General form $f(x) =$ $a \neq 0$ y-intercept: axis of symmetry: $x =$ vertex: $\left(\quad \quad \right)$	Vertex form $f(x) =$ $a \neq 0$ axis of symmetry: vertex: $\left(\quad \quad \right)$	Intercept form $f(x) =$ $a \neq 0$ x-intercepts: axis of symmetry: $x =$ vertex: $\left(\quad \quad \right)$
$\Rightarrow$ the parabola is $\quad \quad \quad$ and the vertex is a minimum point. $\Rightarrow$ the parabola is $\quad \quad \quad$ and the vertex is a maximum point.		

Apply your Skills

Each of the following functions can be written in the form $f(x) = a(x - p)(x - q)$.

Find the values of a , p and q and then write down the coordinates of the x - and y -intercepts of the graph of $y = f(x)$.

a $f(x) = x^2 + 6x - 16$

b $f(x) = -4x^2 + 2x$

a The function $f(x) = 3(x - 1)(x + 2)$ can be written in the form $f(x) = ax^2 + bx + c$. Find the values of a , b and c and then write down the coordinates of the x - and y -intercepts of the graph $y = f(x)$.

b The function $f(x) = -\frac{1}{2}(x - 4)^2 - 2$ can be written in the form $f(x) = ax^2 + bx + c$. Find the values of a , b and c and the coordinates of the vertex and the y -intercept of the graph $y = f(x)$.

