Name: ____________________

Graphical Features of a Quadratic

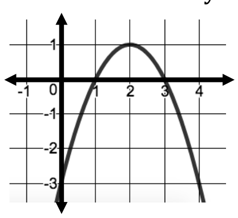
Where the quadratic turns:

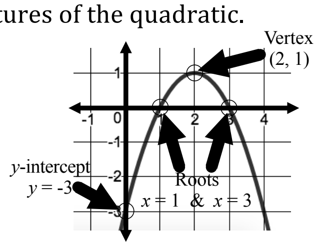
Vertex	Axis of Symmetry	Maximum or Minimum
The point where the quadratic turns. (h, k)	The x-value of the vertex. $x = h$	The y-value of the vertex. $y = k$ When graph faces down, making a hill: "Maximum" is the highest value (vertex y). When graph faces up, making a valley: "Minimum" is the lowest value (vertex y).

Where the quadratic crosses the x- and y-axes:

Roots, Zeros, Solutions, X-intercepts	Y-intercept
Where the parabola crosses the x-axis (flat axis). $x = r_1$ & $x = r_2$ or $(r_1, 0)$ & $(r_2, 0)$	Where the parabola crosses the y-axis (tall axis). $y = c$

EXAMPLE Identify the features of the quadratic.



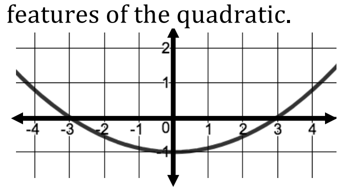


This graph has a ***MAXIMUM****, because it is facing down, which means the vertex is the TOP point on the graph – the maximum.*

Vertex	Axis of Symmetry	(Circle one) Max or Min
$\boxed{(2, 1)}$	$\boxed{x = 2}$	$\boxed{y = 1}$

Roots, Zeros, Solutions, X-intercepts	Y-intercept
$\boxed{x = 1 \ \& \ x = 3}$	$\boxed{y = -3}$

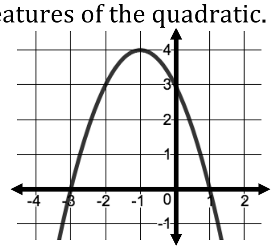
1. Identify the features of the quadratic.



Vertex	Axis of Symmetry	(Circle one) Max or Min

Roots, Zeros, Solutions, X-intercepts	Y-intercept

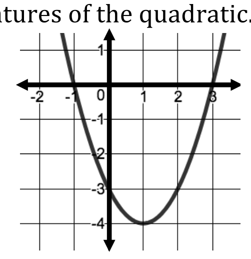
2. Identify the features of the quadratic.



Vertex	Axis of Symmetry	(Circle one) Max or Min

Roots, Zeros, Solutions, X-intercepts	Y-intercept

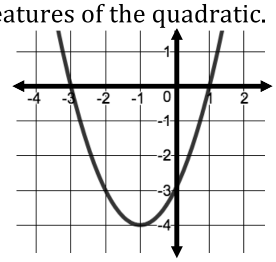
3. Identify the features of the quadratic.



Vertex	Axis of Symmetry	(Circle one) Max or Min

Roots, Zeros, Solutions, X-intercepts	Y-intercept

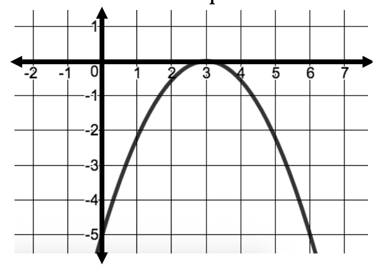
4. Identify the features of the quadratic.



Vertex	Axis of Symmetry	(Circle one) Max or Min

Roots, Zeros, Solutions, X-intercepts	Y-intercept

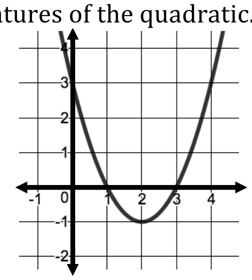
5. Identify the features of the quadratic.



Vertex	Axis of Symmetry	(Circle one) Max or Min

Roots, Zeros, Solutions, X-intercepts	Y-intercept

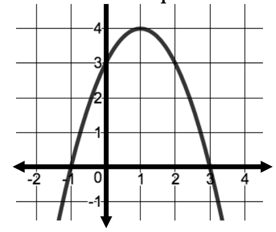
6. Identify the features of the quadratic.



Vertex	Axis of Symmetry	(Circle one) Max or Min

Roots, Zeros, Solutions, X-intercepts	Y-intercept

7. Identify the features of the quadratic.

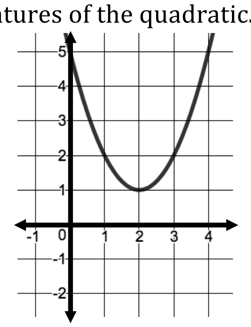


Vertex	Axis of Symmetry	(Circle one) Max or Min

Roots, Zeros, Solutions, X-intercepts	Y-intercept

If the graph of a quadratic does not cross the x-axis, then there are no real roots.

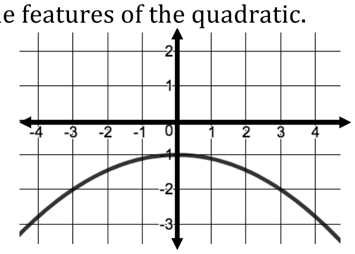
8. Identify the features of the quadratic.



Vertex	Axis of Symmetry	(Circle one) Max or Min

Roots, Zeros, Solutions, X-intercepts	Y-intercept

9. Identify the features of the quadratic.



Vertex	Axis of Symmetry	(Circle one) Max or Min

Roots, Zeros, Solutions, X-intercepts	Y-intercept

Name: ____________________

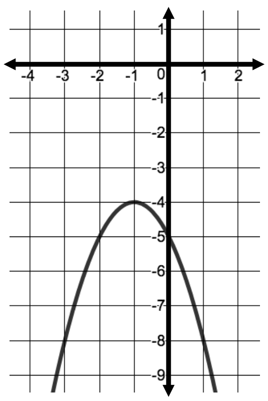
Imaginary Roots of a Quadratic

When a quadratic does not cross the *x*-axis, it means the quadratic does not have any *real* roots. This does not mean, however, that it does not have any roots at all. If there are no real roots, there will always be two imaginary ones.

To determine your imaginary roots, you have to do three things:

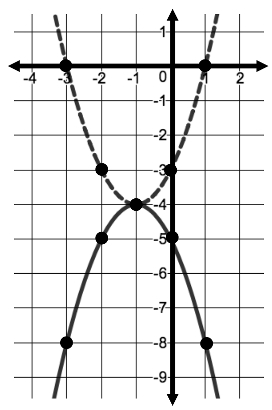
1. Understand that the imaginary root will always be $x = h - \_\_\_ i$ and $x = h + \_\_\_ i$.
2. Carefully draw a reflected version of your quadratic (flip it up or down over the vertex, mirroring each point), so that you can see where it *would have* crossed the axis.
3. Count right (or left) from your axis of symmetry (h) until you get to the *x*-value of the imaginary zeros.
   (This number is the amount of i that you will add and subtract from h.)

Example

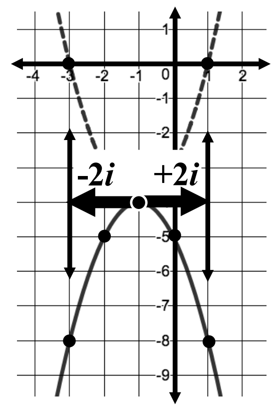


The axis of symmetry (vertex x-value) is at x = -1.
So, my imaginary roots will be at
$x = -1 - \_\_\_ i$ & $x = -1 + \_\_\_ i$

Imagine the graph reflected (flipped over) so that it would cross the x-axis:



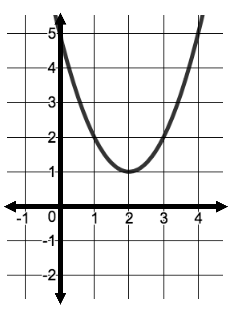
Count outward from the vertex to determine how far left-right the zeros *<u>would be</u>* *from the axis of symmetry (put an "i" behind that number):*



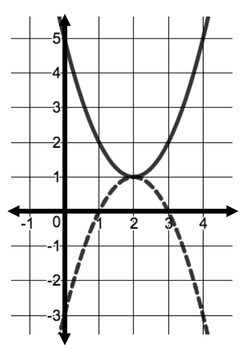
The roots are:
$\boxed{x = -1 - 2i \ \& \ x = -1 + 2i}$

Determine the imaginary roots.

1.



Reflected version:



How far (left or right) from the axis of symmetry (vertex x) would the zeros be?

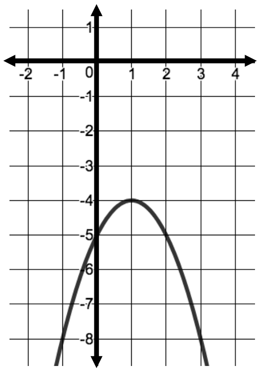
The imaginary roots are:

$x = \_\_\_ - \_\_\_ i$

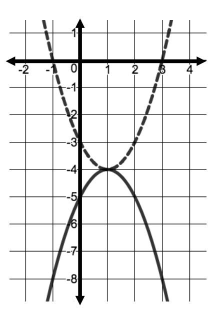
&

$x = \_\_\_ + \_\_\_ i$

2.



Reflected version:



How far (left or right) from the axis of symmetry (vertex x) would the zeros be?

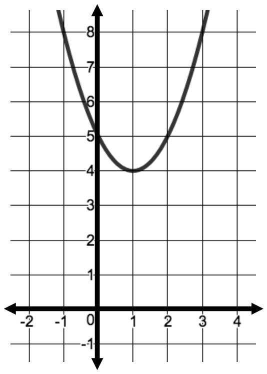
The imaginary roots are:

$x = \_\_\_ - \_\_\_ i$

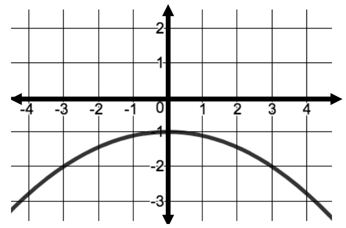
&

$x = \_\_\_ + \_\_\_ i$

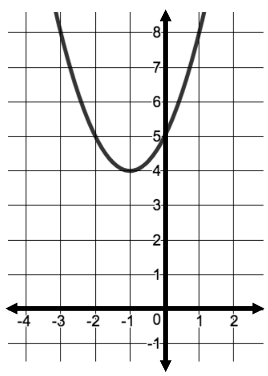
3.



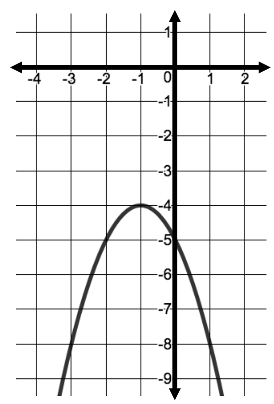
4.



5.



6.



Graphical Features of a Quadratic Answers

1. Vertex: $(0,-1)$	Axis of Sym: $x=0$	$\boxed{Min}$: $y=-1$	Roots: $x=-3, x=3$	y-int: $y=-1$
2. Vertex: $(-1,4)$	Axis of Sym: $x=-1$	$\boxed{Max}$: $y=4$	Roots: $x=-3, x=1$	y-int: $y=3$
3. Vertex: $(1,-4)$	Axis of Sym: $x=1$	$\boxed{Min}$: $y=-4$	Roots: $x=-1, x=3$	y-int: $y=-3$
4. Vertex: $(1,-4)$	Axis of Sym: $x=1$	$\boxed{Min}$: $y=-4$	Roots: $x=-3, x=1$	y-int: $y=-3$
5. Vertex: $(3,0)$	Axis of Sym: $x=3$	$\boxed{Max}$: $y=0$	Roots: $x=3$	y-int: $y=-5$
6. Vertex: $(2,-1)$	Axis of Sym: $x=2$	$\boxed{Min}$: $y=-1$	Roots: $x=1, x=3$	y-int: $y=3$
7. Vertex: $(1,4)$	Axis of Sym: $x=1$	$\boxed{Max}$: $y=4$	Roots: $x=-1, x=3$	y-int: $y=3$
8. Vertex: $(2,1)$	Axis of Sym: $x=2$	$\boxed{Min}$: $y=1$	Roots: No real roots	y-int: $y=5$
9. Vertex: $(0,-1)$	Axis of Sym: $x=0$	$\boxed{Max}$: $y=-1$	Roots: No real roots	y-int: $y=-1$

Imaginary Roots of a Quadratic Answers

1. $x=2-1i$ & $x=2+1i$	2. $x=1-2i$ & $x=1+2i$	3. $x=1-2i$ & $x=1+2i$
4. $x=0-3i$ & $x=0+3i$ $\boxed{x=-3i \ \& \ x=3i}$	5. $x=-1-2i$ & $x=-1+2i$	6. $x=-1-2i$ & $x=-1+2i$