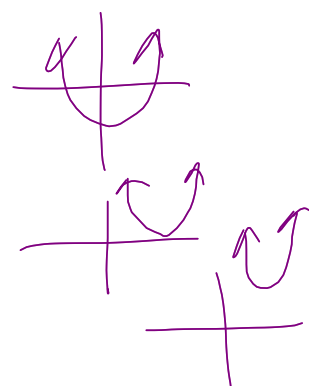


Section 5 – Topic 12
Key Features of Quadratic Functions

The key features of quadratic functions are:

- Intercepts
- Intervals where the function is increasing or decreasing
- Intervals where the function is positive or negative
- Symmetry
- End behavior



How many x -intercept(s) does a quadratic function have?

2, 0, 1

How many y -intercept(s) does a quadratic function have?

1

Describe the symmetry of a quadratic function.

Symmetric about the x -value of the vertex

Describe the end behavior of quadratic functions with a positive quadratic term.

up & up



Describe the end behavior of quadratic functions with a negative quadratic term.

down & down

Let's Practice!

vertex $(-1, -3)$

1. Determine the following features for $f(x) = (x + 1)^2 - 3$.

a. x-intercept: $0 = (x+1)^2 - 3$ $3 = (x+1)^2$ $\pm\sqrt{3} = x+1$
 $(-1 \pm \sqrt{3}, 0)$ $+3$ $+3$ $\sqrt{3} = \sqrt{(x+1)^2}$ -1 -1
 $-1 \pm \sqrt{3} = x$

b. y-intercept: $(0, -2)$ $f(x) = (0+1)^2 - 3$ $f(x) = 1 - 3$ $f(x) = -2$
 $= (1)^2 - 3$

c. Increasing interval(s):

$(-1, \infty)$

d. Decreasing interval(s):

$(-\infty, -1)$

e. Positive interval(s): above x-axis

$(-\infty, -1 - \sqrt{3}) \cup (-1 + \sqrt{3}, \infty)$

f. Negative interval(s): below x-axis

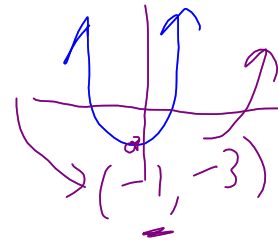
$(-1 - \sqrt{3}, -1 + \sqrt{3})$

g. Symmetry:

over $x = -1$

h. End behavior:

up & up



Try it!

2. Give an algebraic representation of a quadratic function for each of the following features.

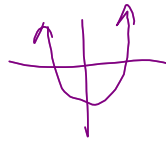
a. No x -intercept:

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



b. y -intercept at $(0, -3)$:

$$f(x) = (x-0)^2 - 3$$



c. Increasing interval over $(2, \infty)$:

$$f(x) = (x-2)^2$$



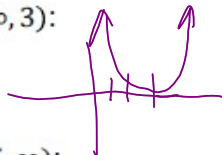
d. Decreasing interval over $(2, \infty)$:

$$f(x) = -(x-2)^2$$



e. Positive interval over $(-\infty, 3)$:

$$f(x) = (x-3)^2$$



f. Negative interval over $(5, \infty)$:

$$f(x) = -(x-5)^2$$



g. Symmetric about the y -axis:

$$y = x^2 \quad f(x) = x^2$$



h. End behavior: As $x \rightarrow -\infty, y \rightarrow \infty$:

11. Complete the following table by describing key features of quadratic functions.

Quadratic functions have two x -intercepts.	<input type="radio"/> Always <input checked="" type="radio"/> Sometimes <input type="radio"/> Never
Quadratic functions have one y -intercept.	<input checked="" type="radio"/> Always <input type="radio"/> Sometimes <input type="radio"/> Never
Quadratic functions are increasing.	<input type="radio"/> Always <input checked="" type="radio"/> Sometimes <input type="radio"/> Never
Quadratic functions are symmetric about the y -axis.	<input type="radio"/> Always <input checked="" type="radio"/> Sometimes <input type="radio"/> Never
Quadratic functions are symmetric about the x -axis.	<input type="radio"/> Always <input type="radio"/> Sometimes <input checked="" type="radio"/> Never
In quadratic functions, as $x \rightarrow \infty$, $y \rightarrow -\infty$.	<input type="radio"/> Always <input checked="" type="radio"/> Sometimes <input type="radio"/> Never

