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 or 1 or 0

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

1

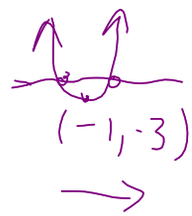
Describe the symmetry of a quadratic function. Symmetric over a value of x

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

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

Let's Practice!

vertex $(-1,-3)$



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

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

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

   c. Increasing interval(s): $(-1,\infty)$

   d. Decreasing interval(s): $(-\infty,-1)$

   e. Positive interval(s): $(-\infty,-1-\sqrt{3}) \cup (-1+\sqrt{3},\infty)$

   f. Negative interval(s): $(-1-\sqrt{3},-1+\sqrt{3})$

   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: $f(x) = 3(x+1)^2 + 6$

   b. y –intercept at $(0, -3)$: $f(x) = x^2 + 10x - 3$

   c. Increasing interval over $(2, \infty)$: $f(x) = 4(x-2)^2 + 2$

   d. Decreasing interval over $(2, \infty)$: $f(x) = -4(x-2)^2 + 2$

   e. Positive interval over $(-\infty, 3)$: $f(x) = 5(x-3)^2$

   f. Negative interval over $(5, \infty)$: $f(x) = -7(x-5)^2$

   g. Symmetric about the y –axis: $f(x)^2 = x^2 - 8$

   h. End behavior: As $x \to -\infty$, $y \to \infty$: $f(x) = -7x^2 + 3x + 2$

BEAT THE TEST!

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

Quadratic functions have two x –intercepts.	○ Always ● Sometimes ○ Never
Quadratic functions have one y –intercept.	● Always ○ Sometimes ○ Never
Quadratic functions are increasing.	○ Always ● Sometimes ○ Never
Quadratic functions are symmetric about the y –axis.	○ Always ● Sometimes ○ Never
Quadratic functions are symmetric about the x –axis.	○ Always ○ Sometimes ● Never
In quadratic functions, as $x \to \infty$, $y \to -\infty$.	○ Always ● Sometimes ○ Never