Objective: Identify Key Features of a Quadratic Function.

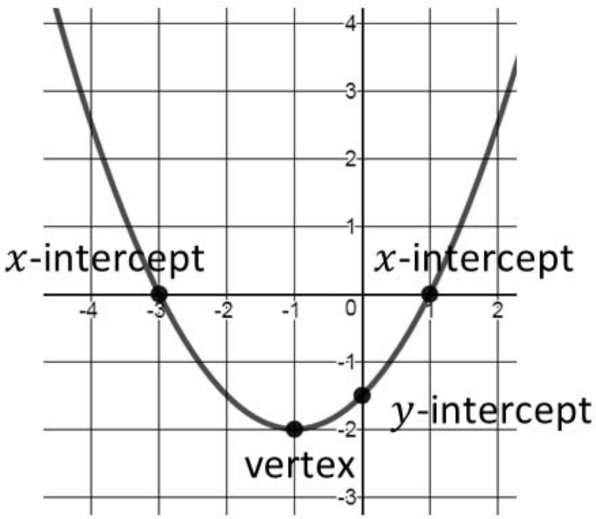
Concept

y-intercept: the point where the function intersects the y-axis (a function can have only one y-intercept)

x-intercept: any point where the function intersects the x-axis (a quadratic function can have no x-intercepts, 1 x-intercept, or 2 x-intercepts)

Vertex: the point where a parabola changes direction; the vertex is a **minimum** if it is the lowest point on the graph; the vertex is a **maximum** if it is the highest point on the graph

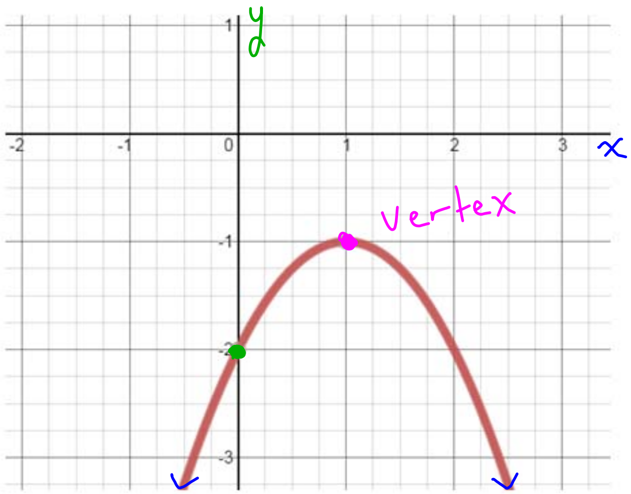
$$f(x)=\frac{1}{2}(x+1)^2-2$$



Objective: Identify Key Features of a Quadratic Function.

Ex) Find the key features for each quadratic function.

$h(x) = -(x-1)^2 - 1$

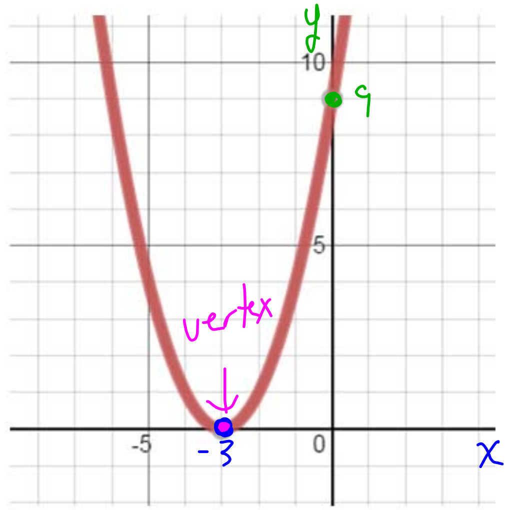


x-intercept(s) none

y-intercept (0, -2)

Vertex: (1, -1) ; maximum

$k(x) = (x+3)^2$



x-intercept(s) (-3, 0)

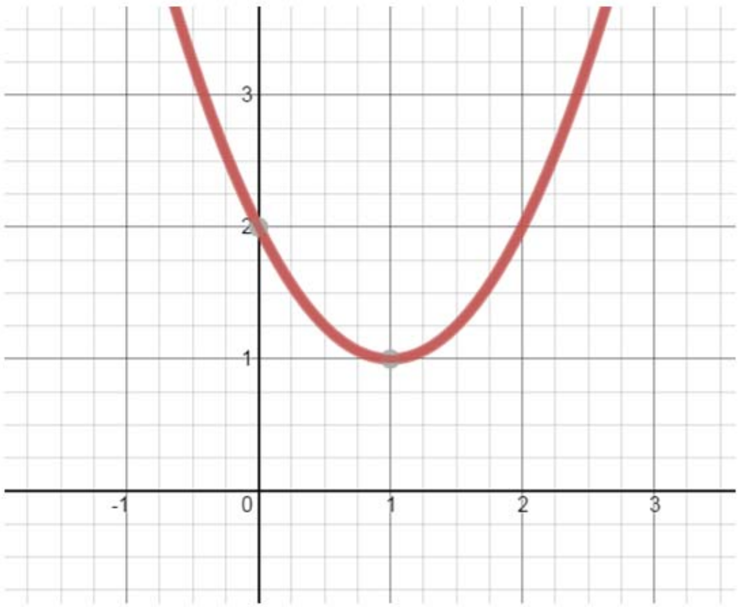
y-intercept (0, 9)

Vertex: (-3, 0) ; minimum

Objective: Identify Key Features of a Quadratic Function.

Practice) Find the key features for each quadratic function.

$$d(x) = (x-1)^2 + 1$$



x-intercept(s) *none*

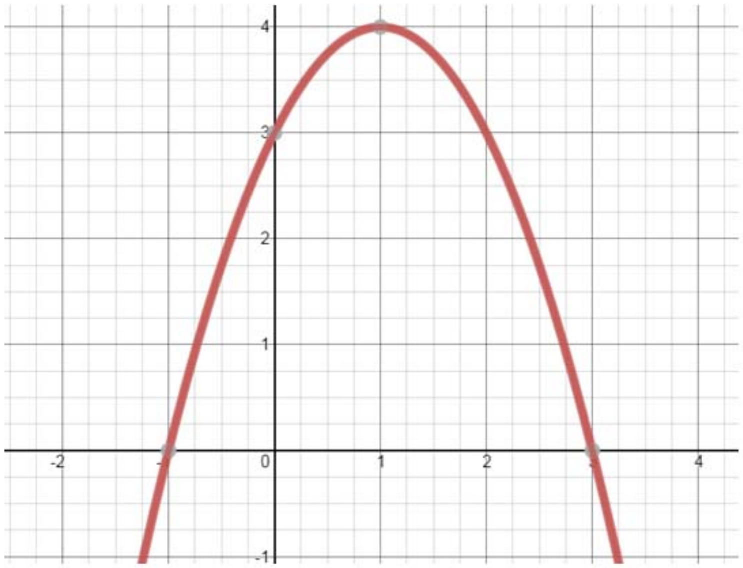
y-intercept (0,2)

Vertex: (1,1), *minimum*

Objective: Identify Key Features of a Quadratic Function.

Practice) Find the key features for each quadratic function.

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



x-intercept(s) $(-1,0)$ and $(3,0)$

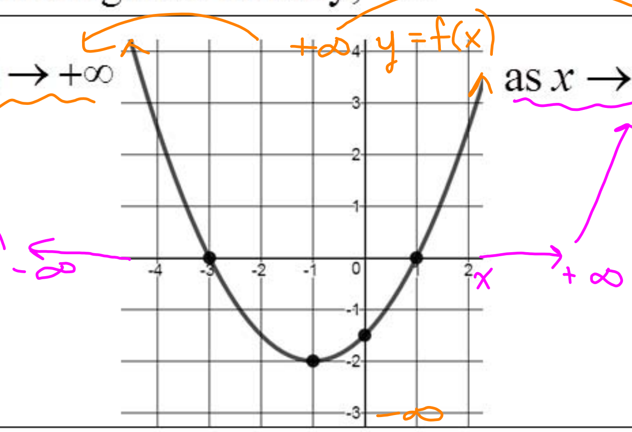
y-intercept $(0,3)$

Vertex: $(1,4)$, maximum

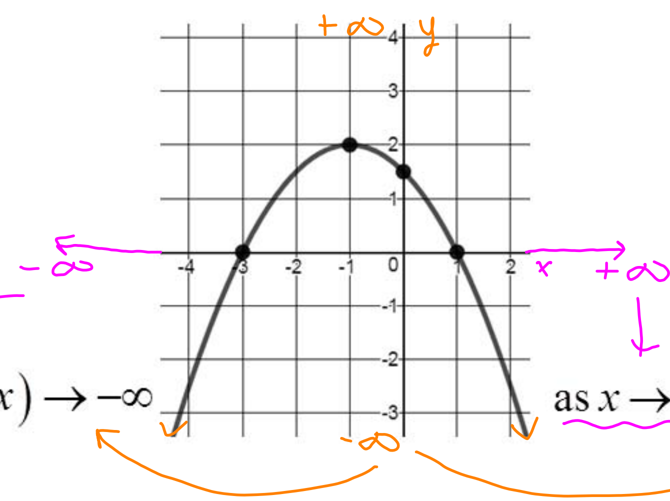
Objective: Identify Key Features of a Quadratic Function.

End Behavior: how the function (y-values, $f(x)$), behaves as the values of x go to positive infinity, $+\infty$, and negative infinity, $-\infty$.

as $x \to -\infty, f(x) \to +\infty$



as $x \to +\infty, f(x) \to +\infty$



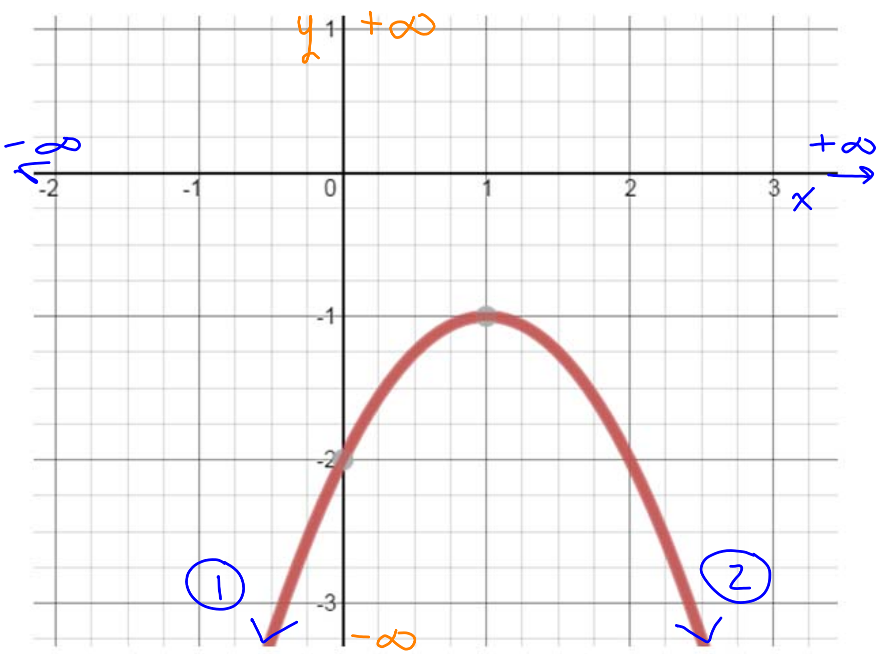
as $x \to -\infty, f(x) \to -\infty$

as $x \to +\infty, f(x) \to -\infty$

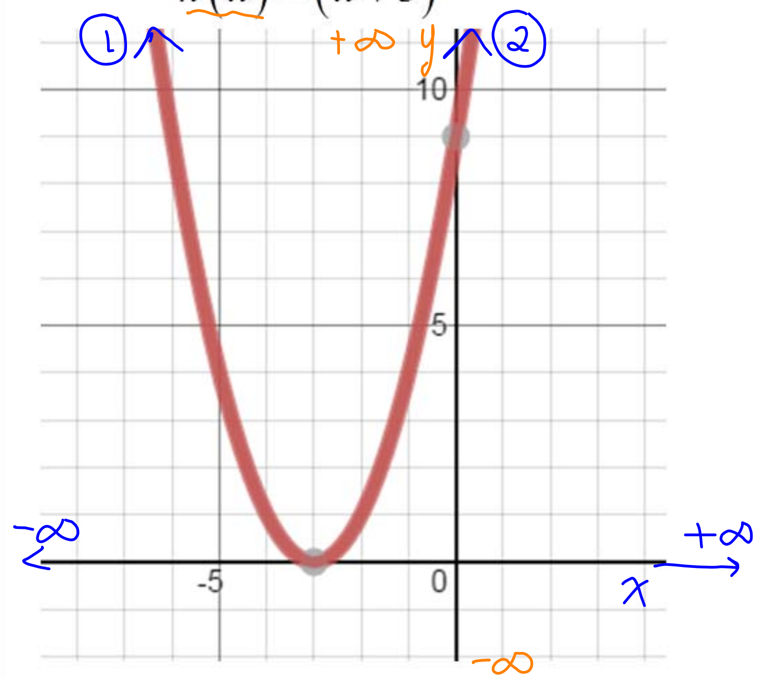
Objective: Identify Key Features of a Quadratic Function.

Ex) State the end behavior for each quadratic function.

$h(x) = -(x-1)^2 - 1$



$k(x) = (x+3)^2$



① as $x \to -\infty$, $h(x) \to -\infty$

② as $x \to +\infty$, $h(x) \to -\infty$

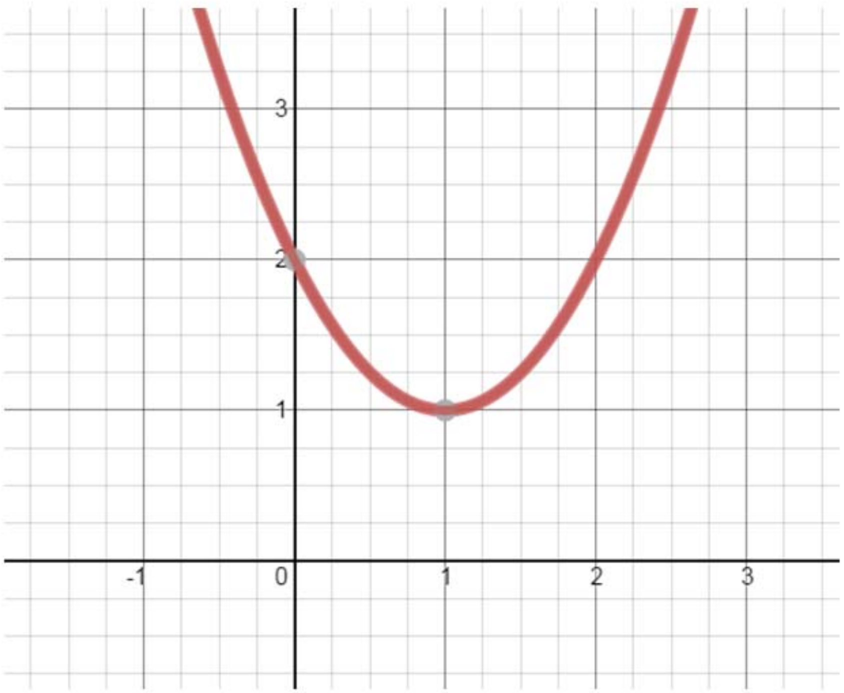
① as $x \to -\infty$, $k(x) \to +\infty$

② as $x \to +\infty$, $k(x) \to +\infty$

Objective: Identify Key Features of a Quadratic Function.

Practice) State the end behavior for the quadratic function.

$$d(x) = (x-1)^2 + 1$$



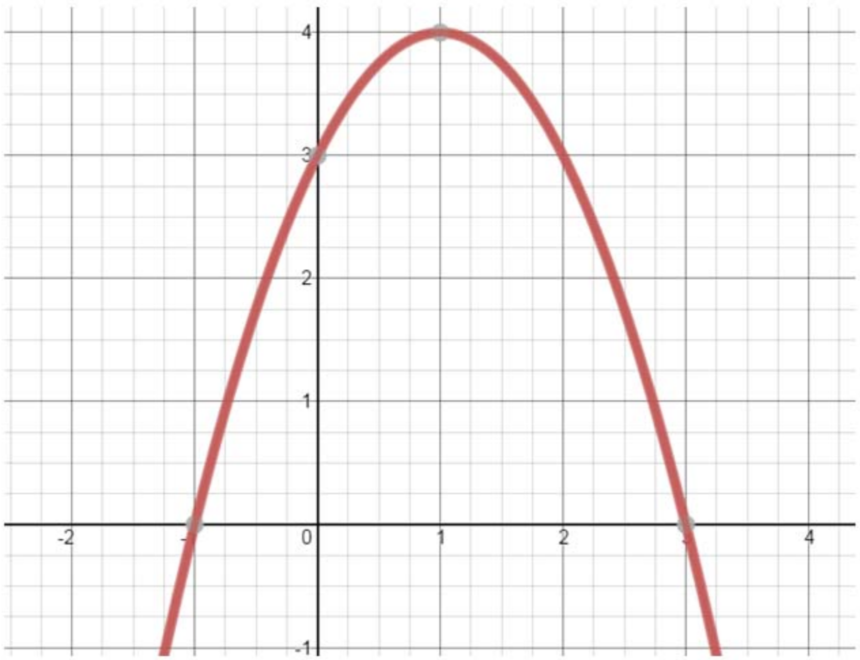
as $x \to -\infty, d(x) \to +\infty$

as $x \to +\infty, d(x) \to +\infty$

Objective: Identify Key Features of a Quadratic Function.

Practice) State the end behavior for the quadratic function.

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



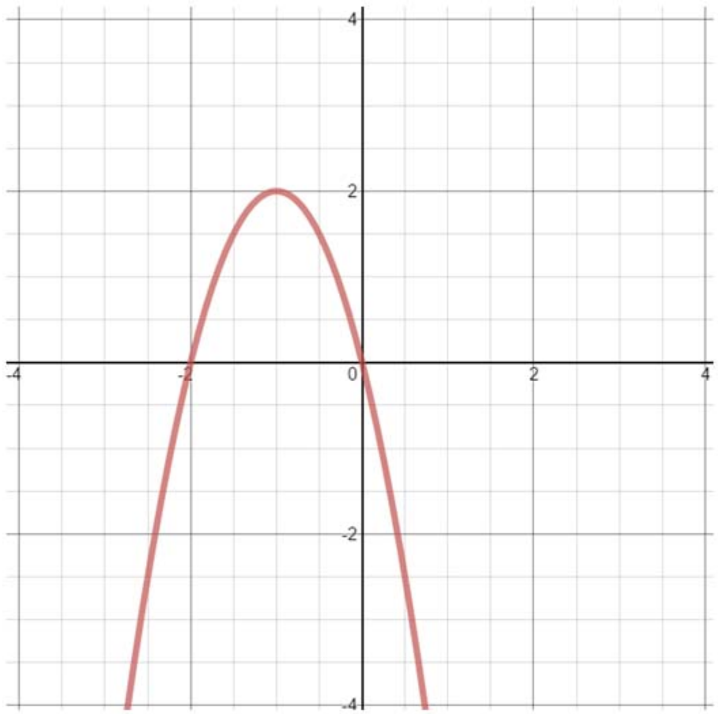
as $x \to -\infty, b(x) \to -\infty$

as $x \to +\infty, b(x) \to -\infty$

Objective: Identify Key Features of a Quadratic Function.

Practice) Find all of the key features of the quadratic function.

$$c(x) = -2(x+1)^2 + 2$$



x-intercept(s) $(-2,0)$ and $(0,0)$

y-intercept $(0,0)$

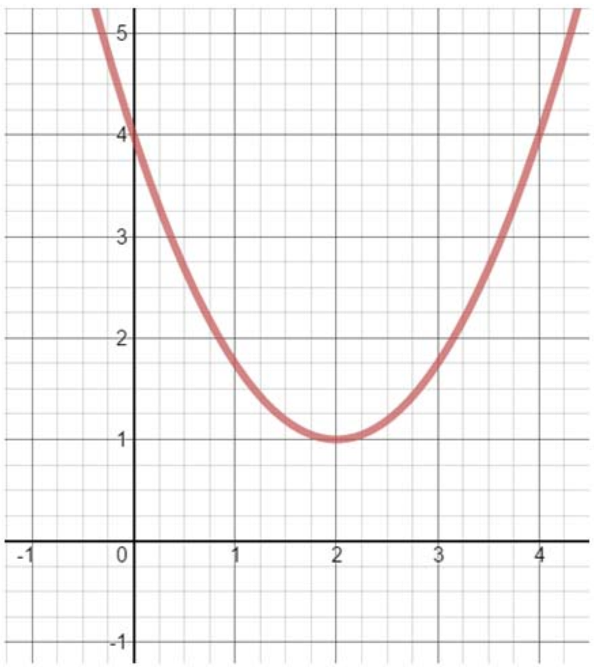
Vertex: $(-1,2)$, maximum

End Behavior: as $x \to -\infty, c(x) \to -\infty$
as $x \to +\infty, c(x) \to -\infty$

Objective: Identify Key Features of a Quadratic Function.

Practice) Find all of the key features of the quadratic function.

$$r(x) = \frac{3}{4}(x-2)^2 + 1$$



x-intercept(s) ___ *none* ___

y-intercept ___ (0,4) ___

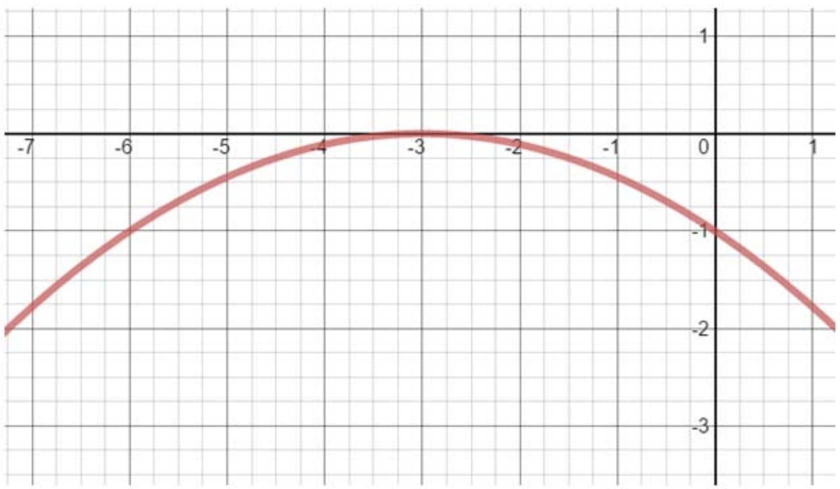
Vertex: ___ (2,1), *minimum* ___

End Behavior: $as\ x \to -\infty, r(x) \to +\infty$
$as\ x \to +\infty, r(x) \to +\infty$

Objective: Identify Key Features of a Quadratic Function.

Practice) Find all of the key features of the quadratic function.

$$v(x) = -\frac{1}{9}(x+3)^2$$



x-intercept(s) $(-3,0)$

y-intercept $(0,-1)$

Vertex: $(-3,0), maximum$

End Behavior: $as\ x \to -\infty, v(x) \to -\infty$
$as\ x \to +\infty, v(x) \to -\infty$

Objective: Identify Key Features of a Quadratic Function.

Closure

Wilma thinks that a parabola will always have an x-intercept. Sketch the graph of a quadratic function that is a counterexample.