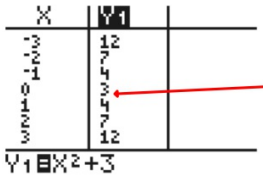
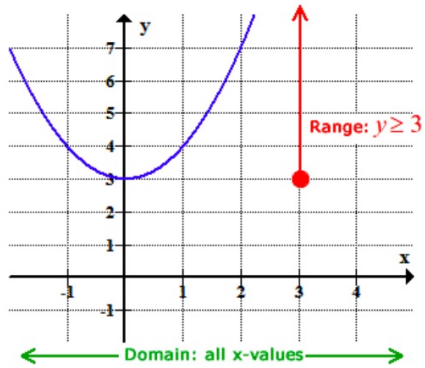
Domain of a function: The set of all possible x values in a function

Range of a function: The set of all possible y values in a function

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

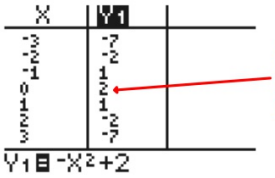


All the y-values in this function rule will only be greater than or equal to 3.

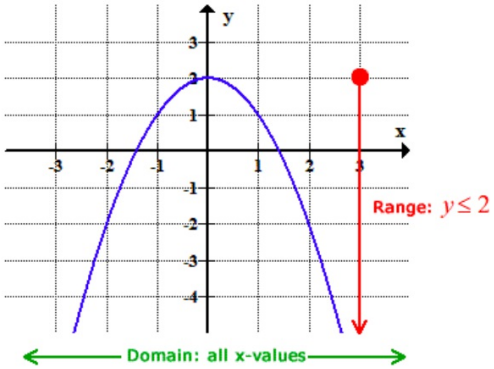


Domain:	all real numbers	$(-\infty,\infty)$
Range:	$\{y \mid y \geq 3\}$	$[3, \infty)$

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



All the y-values in this function rule will only be less than or equal to 2.

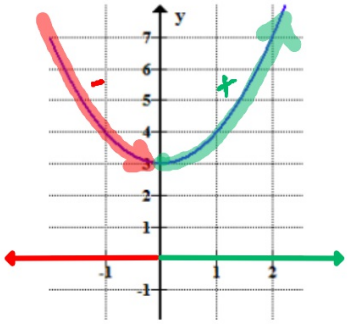


Domain:	$\mathbb{R}$	$(-\infty,\infty)$
Range:	$\{y \mid y \leq 2\}$	$(-\infty, 2]$

Intervals of increasing and decreasing

When is a function increasing? within the set of x values that cause the y values to increase (positive slope)

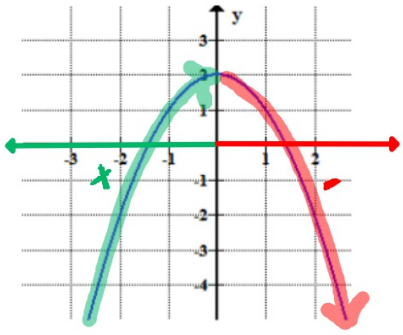
When is a function decreasing? within the set of x values that cause the y values to decrease (negative slope)



The y values increase (+ slope) when $x > 0$, or from 0 to ∞.

The y values decrease (- slope) when $x < 0$, or from $-\infty$ to 0.

Increasing:	$\{x \mid x > 0\}$	$(0, \infty)$
Decreasing:	$\{x \mid x < 0\}$	$(-\infty, 0)$



The y values increase (+ slope) when $x < 0$, of from $-\infty$ to 0.

The y values decrease (- slope) when $x > 0$, or from 0 to ∞.

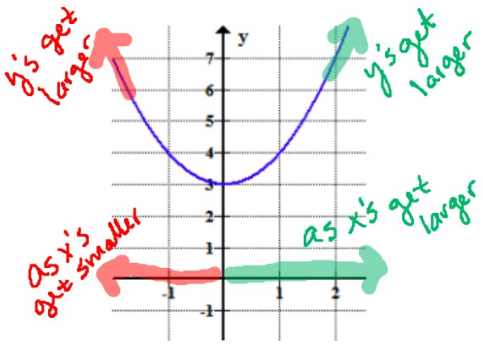
Increasing:	$\{x \mid x < 0\}$	$(-\infty, 0)$
Decreasing:	$\{x \mid x > 0\}$	$(0, \infty)$

End Behavior

End behavior explains what is going on at the ends of the graph.
(direction arrows are pointing)

What are the y values doing as the x values are getting larger?

What are the y values doing as the x values are getting smaller?

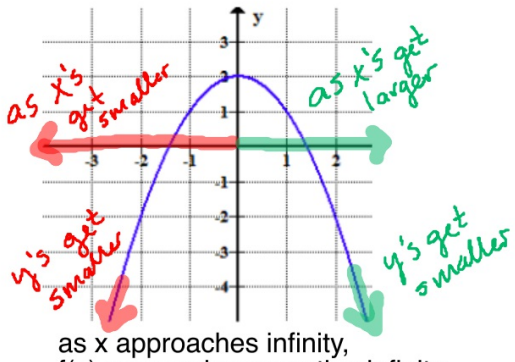


as x approaches infinity,
y approaches infinity.

$$\text{as } x \to \infty,\ y \to \infty$$

as x approaches negative infinity,
y approaches infinity.

$$\text{as } x \to -\infty,\ y \to \infty$$



as x approaches infinity,
f(x) approaches negative infinity.

$$\text{as } x \to \infty,\ f(x) \to -\infty$$

as x approaches negative infinity,
f(x) approaches negative infinity.

$$\text{as } x \to -\infty,\ f(x) \to -\infty$$

1. Identify if the function has a max or min value

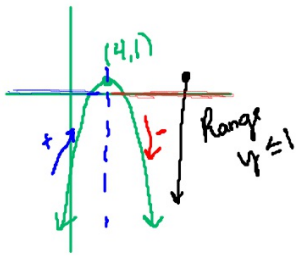
2. Find the vertex.

3. Sketch a graph

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

Max

Vertex: (4, 1)



Domain: All Real #'s $(-\infty, \infty)$

Range: $y \leq 1$ $(-\infty, 1]$

Increasing: $x < 1$ $(-\infty, 1)$

Decreasing: $x > 1$ $(1, \infty)$

End Behavior: (arrows point down) $x \to \infty,\ f(x) \to -\infty$; $x \to -\infty,\ f(x) \to -\infty$

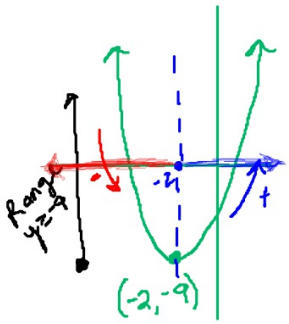
$f(x) = x^2 + 4x - 5$

min

$(x + 4x + 4) - 5 - 4$

$(x + 2)^2 - 9$

Vertex: (-2, -9)



Domain: $\mathbb{R}$ $(-\infty, \infty)$

Range: $y \geq -9$ $[-9, \infty)$

Increasing: $x > -2$ $(-2, \infty)$

Decreasing: $x < -2$ $(-\infty, -2)$

End Behavior: (arrows point up) $x \to \infty,\ y \to \infty$; $x \to -\infty,\ y \to \infty$