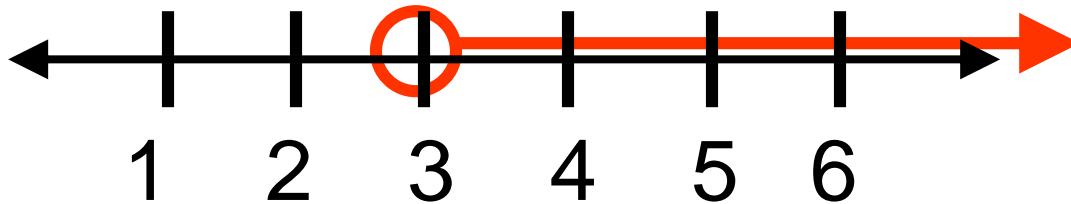# Math-2A
Lesson 6-2
Analyzing the Graphs of Functions
(Where the function is positive and negative)

Three Ways to describe a shaded region of a number line.

1. Graph:

2. Inequality: $x > 3$

3. Interval Notation: $(3, \infty)$

Interval notation   vs. inequality notation

(1, 2)   Looks like the ordered pair: x = 1, y = 2

From the context where it is used you will be able to tell
 if it is an ordered pair or an interval of numbers.

(1, 2)   "all of the #'s between (but not including) 1 and 2"

(1, 2)   means the same thing as: 1 < x < 2

[1, 2]   "all of the #'s between (including) 1 and 2"

[1, 2]:   means the same thing as: 1 ≤ x ≤ 2

Inteval notation vs. inequality notation
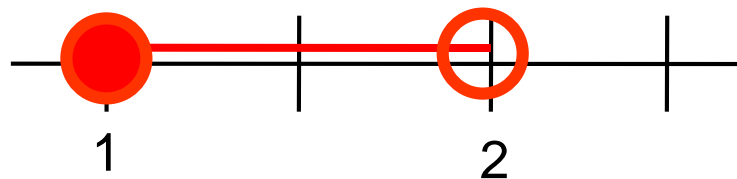
Convert to Inequality notation:

[1, 2)   1 ≤ x < 2
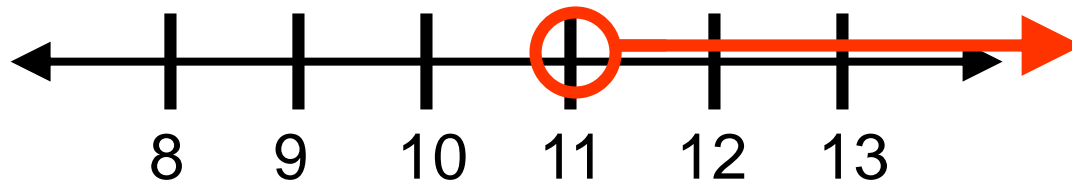
(1, 2]

(∞, 2)

(∞, 2) U (7, ∞)

(∞, 2] U (5, ∞)

Graph

What does the following inequality mean?

x > 11   "all the numbers that are greater than 11"

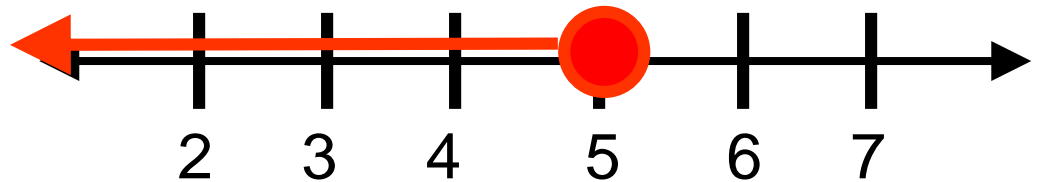Number line equivalent: (shade all #'s that are solutions)

8   9   10   11   12   13

Interval notation equivalent: $x = (11, \infty)$

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x ≤ 5   "all the number that are less than or equal to 5"
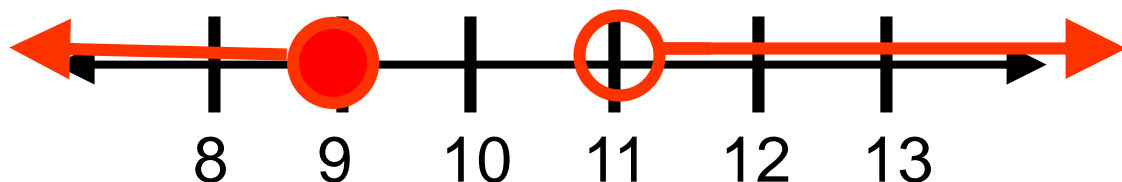
Number line equivalent:

2   3   4   5   6   7

Interval notation equivalent: $x = (-\infty, 5]$

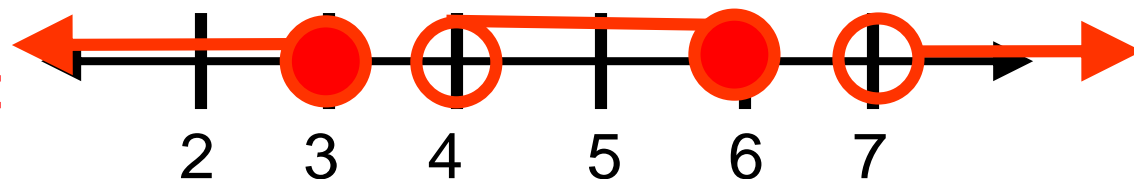A number line can be shaded more than one region.

x > 11 or x < 9

Number line equivalent:

8   9   10   11   12   13

Interval notation equivalent: $x = (-\infty, 9] \cup (11, \infty)$
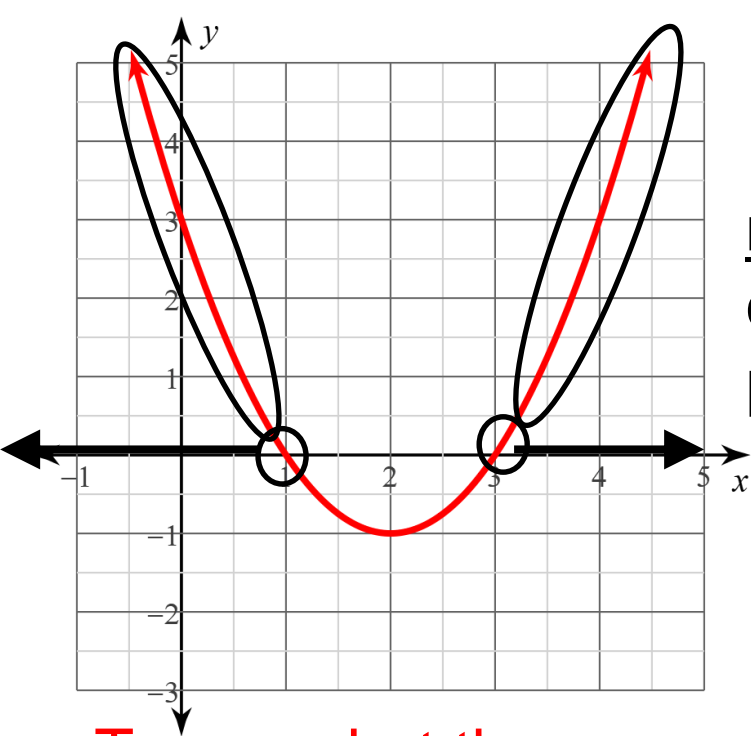
Number line :

2   3   4   5   6   7

$x = (-\infty, 3] \cup (4, 6] \cup (7, \infty)$
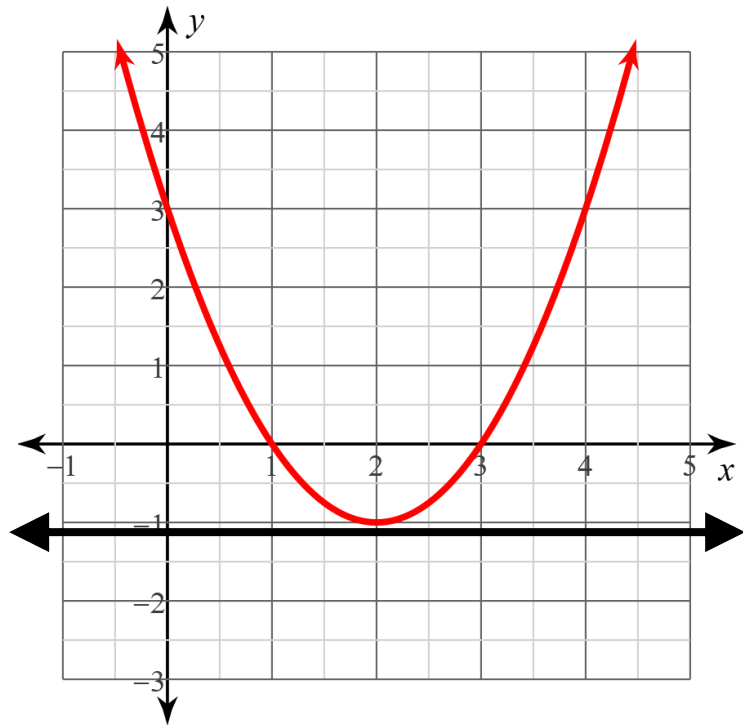
Interval notation equivalent:

Where is the function positive?

means: "What x-values have corresponding y-values that are positive"?

Or, "The graph is above the x-axis for what x-values"?

To see what these x-values are, shade the portion of the x-axis where the graph is above the x-axis.

We say: $f(x) > 0 \ for \ x = (-\infty, 1] \cup [3, \infty)$
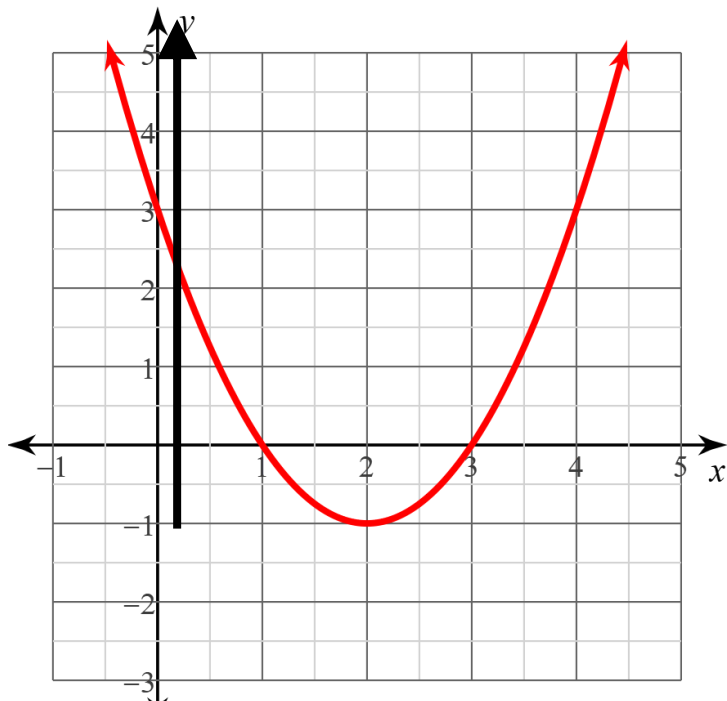
What is the "domain" of the graph?

Means "what values of "x" are found in the graph?"

Which function is the only one which does NOT have "all real numbers" as the domain?

$$y = \sqrt{x}$$

For non-vertical lines, the square function, and the absolute value function, we say the domain is "all real numbers."
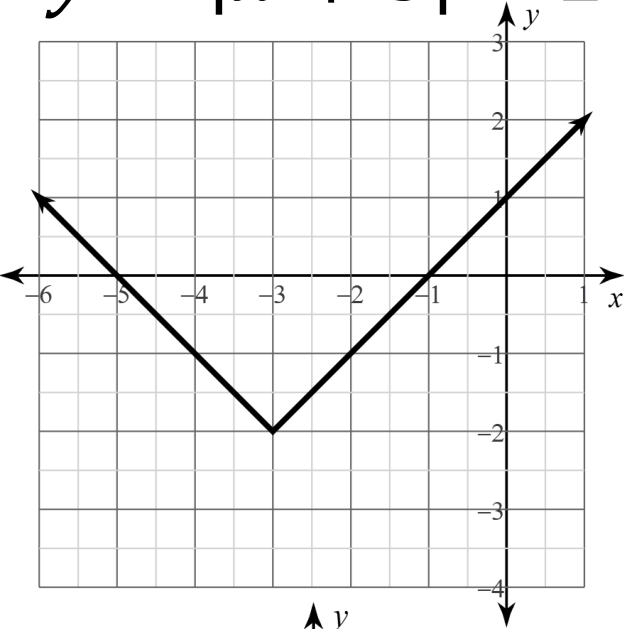
What is the "range" of the graph?

Means "what values of "y" are found in the graph?"

The smallest y-value of this graph is zero, and it goes upward from there.

In "inequality notation" we say the range is: $y \geq 0$

In "interval notation" we say the range is: $y = [0, \infty)$
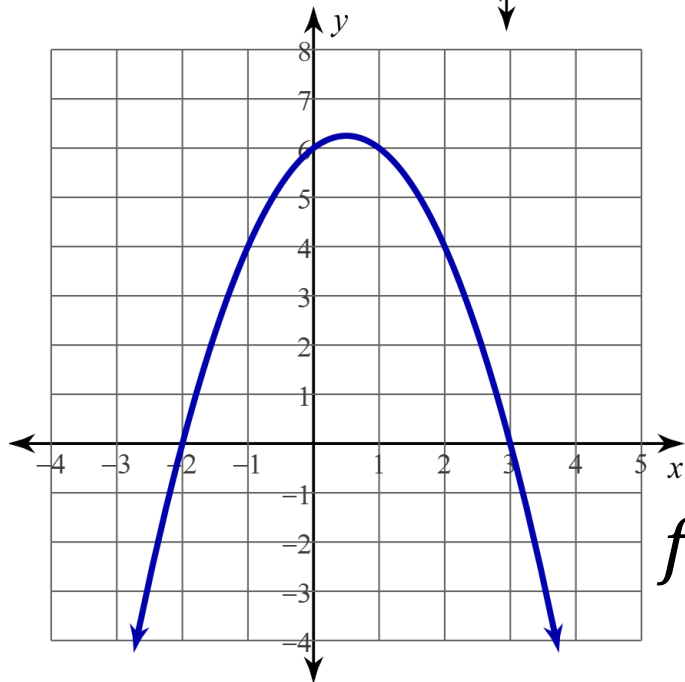
$$y = |x + 3| - 2$$

$$f(x) > 0 \; for \; x = (-\infty, -5) \cup (-1, \infty)$$

2. Where is the function negative?

$$f(x) < 0 \; for \; x = (-5, -1)$$

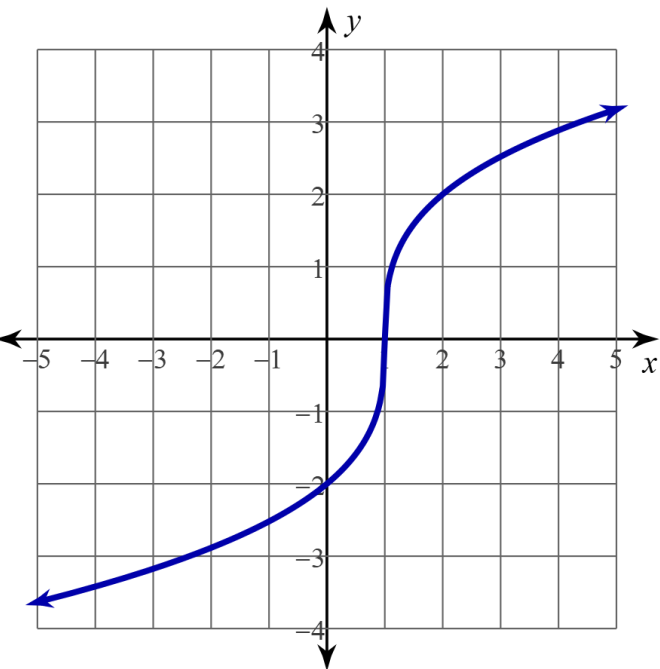3. Where is the function positive?

$$f(x) > 0 \; for \; x = (-2, 3)$$

4. Where is the function negative?

$$f(x) < 0 \; for \; x = (-\infty, -2) \cup (3, \infty)$$
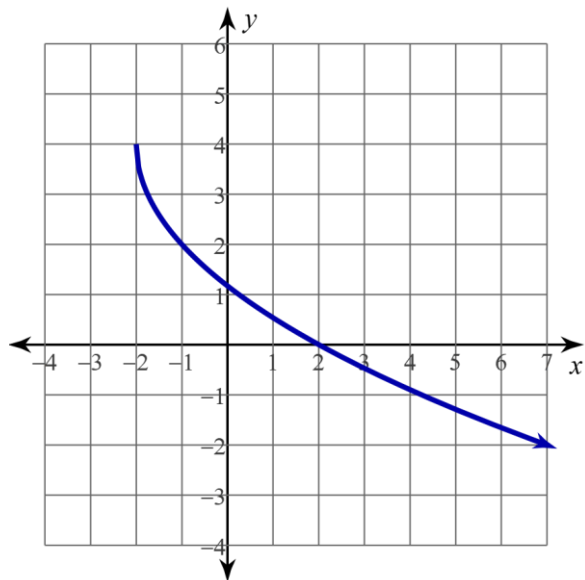
1. Where is the function positive?

$$f(x) > 0 \; for \; x = (1, \infty)$$

2. Where is the function negative?

$$f(x) < 0 \; for \; x = (-\infty, 1)$$

3. Where is the function positive?

$$f(x) > 0 \; for \; x = [-2, 2)$$

4. Where is the function negative?

$$f(x) < 0 \; for \; x = (2, \infty)$$