Basic Set Theory and Interval Notation

Sets

A set is a well-defined collection of things called *elements*. By "well-defined", we mean that we will know whether or not an element belongs in the set.

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The empty set is a set with no elements (symbol is $\varnothing$). This is notation used for "No Solution" answers.

Table of Contents

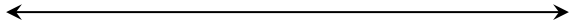
Interval Notation

Interval Notation	Set-Builder Notation	Graph
$(4, 9)$	$\{x \mid 4 < x < 9\}$	
$[4, 9]$	$\{x \mid 4 \leq x \leq 9\}$	
$[4, 9)$	$\{x \mid 4 \leq x < 9\}$	
$(4, 9]$	$\{x \mid 4 < x \leq 9\}$	

Interval Notation

Interval Notation	Set-Builder Notation	Graph
$(4, \infty)$	$\{x \mid x > 4\}$	
$[4, \infty)$	$\{x \mid x \geq 4\}$	
$(-\infty, 9)$	$\{x \mid x < 9\}$	
$(-\infty, 9]$	$\{x \mid x \leq 9\}$	

Interval Notation

Interval Notation	**Set-Builder Notation**	**Graph**
$(-\infty, \infty)$	$\mathbb{R}$	
$\varnothing$	$\{\}$	

Example 1

Express each interval in set-builder notation and graph:

(a) $(-1, 4]$

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$$\{x \mid -1 < x \leq 4\}$$

Example 1

(b) $[2.5, 4]$

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$$\{x \mid 2.5 \leq x \leq 4\}$$

Example 1

(c) $(-4, \infty)$

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$$\{x \mid x > -4\}$$

Example 1

(d) $(-\infty, 5]$

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$$\{x \mid x \leq 5\}$$

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Intersections are common when the variable is *between* two values.

Unions

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Unions are common when the intervals do not overlap (although they can).

Example 2

Write each of the following in interval notation and graph.

(a) $x \leq 4$ or $x > 7$

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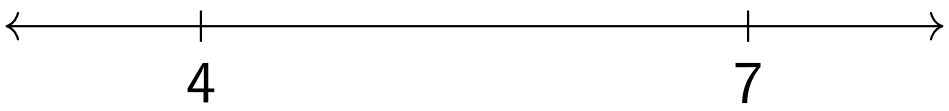

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$$(-\infty, 4] \cup (7, \infty)$$

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(b) $x < 2$ or $x \geq 9$

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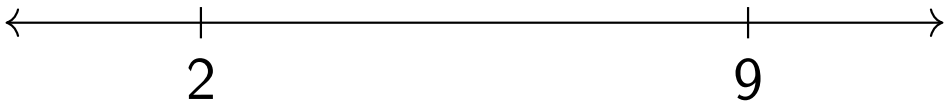

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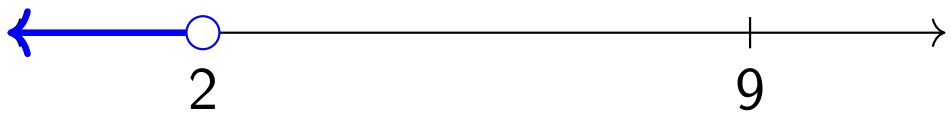

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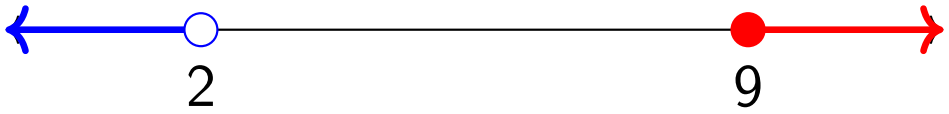

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(b) $x < 2$ or $x \geq 9$

$$(-\infty, 2) \cup [9, \infty)$$

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(c) $0 < x \leq 5$

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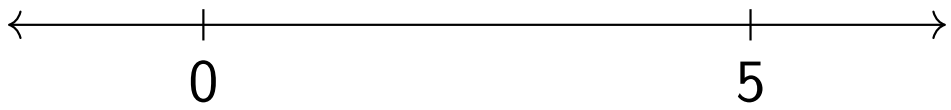

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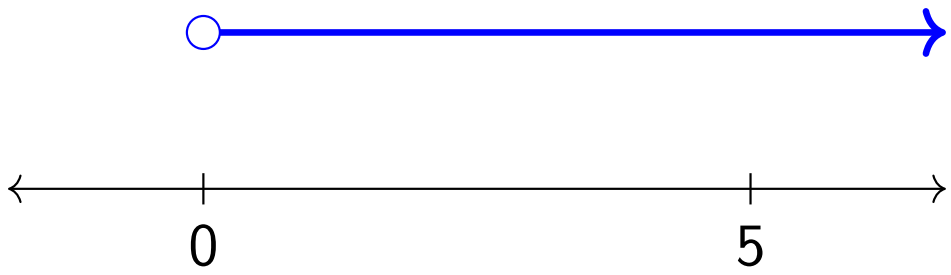

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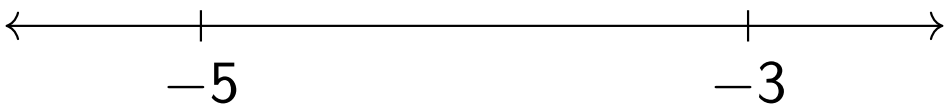

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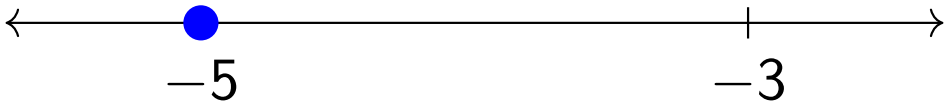

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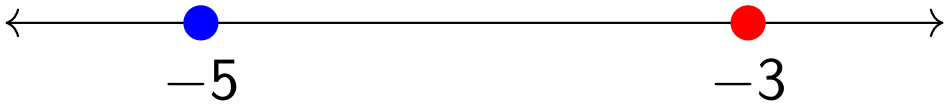

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$$[-5, -3]$$

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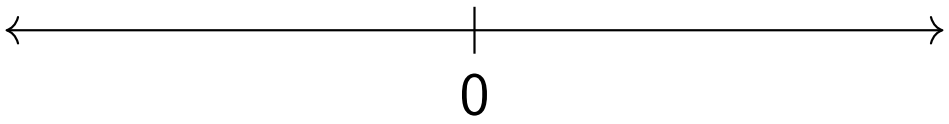

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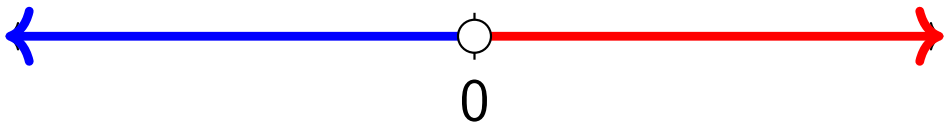

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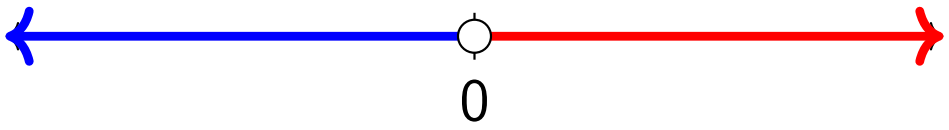

$(-\infty, 0) \cup (0, \infty)$

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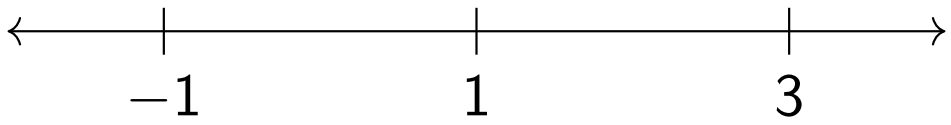

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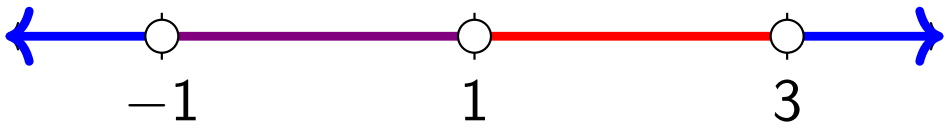

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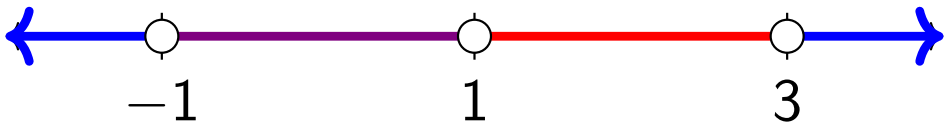

$(-\infty, -1) \cup (-1, 1) \cup (1, 3) \cup (3, \infty)$