Lesson 1.4 - Using Interval Notation to quantify Domain and Range

Learning Objectives: SWBAT
- Define the domain and range of a function using interval notation

What are "Intervals" of a function?
- Intervals are "portions" of the domain of a function (remember, domain = "x" values)
- They have left and right boundaries that include all points on the graph in between
- When the boundary itself is part of the interval, it is represented by a closed circle on the graph
- When the boundary itself is NOT part of the interval, it is represented by an open circle on the graph
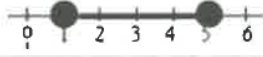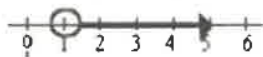- The range of the interval is defined by the least/greatest "y" value

Review of Interval Notation

By interval notation: An interval is a connected subset of numbers. Interval notation is an alternative to expressing your answer as an inequality. Unless specified otherwise, we will be working with real numbers.

| When using interval notation, the symbol: |
| --- |
| (means "not included" or "open". |
| [means "included" or "closed". |

$2 \leq x < 6$	as an inequality.
$[2, 6)$	in interval notation.

The chart below will show you all of the possible ways of utilizing interval notation.

Interval Notation: (description)	(diagram)
Open Interval: (a, b) is interpreted as $a < x < b$ where the endpoints are NOT included. (While this notation resembles an ordered pair, in this context it refers to the interval upon which you are working.)	$(1, 5)$
Closed Interval: $[a, b]$ is interpreted as $a \leq x \leq b$ where the endpoints are included.	$[1, 5]$
Half-Open Interval: $(a, b]$ is interpreted as $a < x \leq b$ where a is not included, but b is included.	$(1, 5]$
Half-Open Interval: $[a, b)$ is interpreted as $a \leq x < b$ where a is included, but b is not included.	$[1, 5)$
Non-ending Interval: (a, ∞) is interpreted as $x > a$ where a is not included and infinity is always expressed as being "open" (not included).	$(1, \infty)$
Non-ending Interval: $(-\infty, b]$ is interpreted as $x \leq b$ where b is included and again, infinity is always expressed as being "open" (not included).	$(-\infty, 5]$

Lesson 1.4 - Using Interval Notation to quantify Domain and Range

<u>Example</u>: Define the domain and range of the graph below using interval notation:
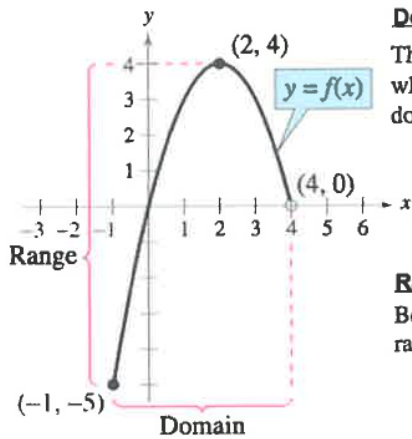
Domain

The closed dot at $(-1, -5)$ indicates that $x = -1$ is in the domain of f, whereas the open dot at $(4, 0)$ indicates that $x = 4$ is not in the domain. So, the domain of f is all x in the interval $[-1, 4)$.
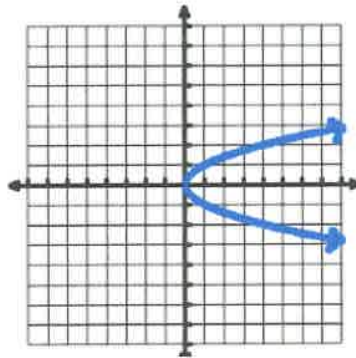
Range

Because the graph does not extend below $f(-1) = -5$ or above $f(2) = 4$, the range of f is the interval $[-5, 4]$.
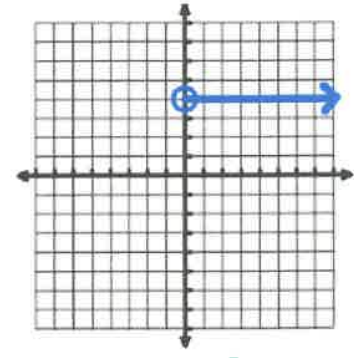
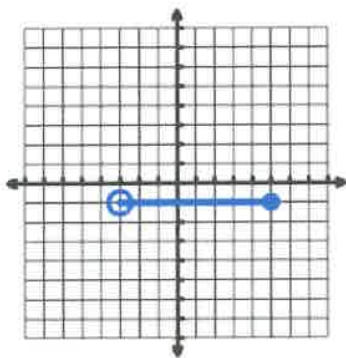<u>Your Turn</u>: Define the domain and range of the graphs below using interval notation:
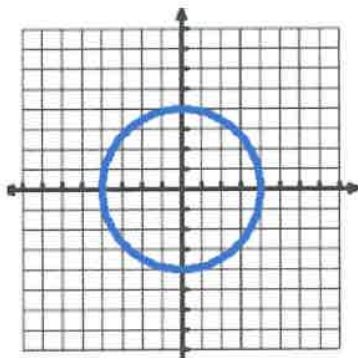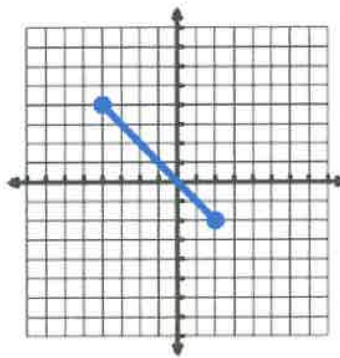
Domain : $[-4, 4]$
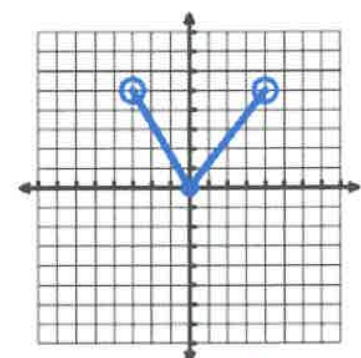Range : $[-4, 4]$

Domain : $[0, \infty)$
Range : $(-\infty, \infty)$

Domain : $(0, \infty)$
Range : $[4]$

Domain : $(-3, \infty)$
Range : $[-1]$

Domain : $[-4, 2]$
Range : $[-2, 4]$

Domain : $(-3, -4)$
Range : $[0, 5)$

Lesson 1.4 - Using Interval Notation to quantify Domain and Range

1)

Domain: $(-\infty, 5]$

Range: $(-\infty, 2]$

2)

Domain: $(-5, -2)$

Range: $(-4, 4)$

3)

Domain: $(-4, \infty)$

Range: $(-1, \infty)$

4)

Domain: $(-\infty, 3]$

Range: $(-2, \infty)$

5)

Domain: $(-4, 3]$

Range: $(-5, 2]$

6)

Domain: $[-4, \infty)$

Range: $[0, \infty)$

7)

Domain: $[-5, 4]$

Range: $[-3, 3]$

8)

Domain: $(-\infty, 0]$

Range: $[-3, \infty)$

9)

Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$