Instruction

Guided Practice 3.1.3

Example 1

Is the relation below a function? Use a mapping diagram to determine your answer.

{(–2, 4), (–1, 1), (0, 0), (1, 1), (2, 4), (3, 9)}

1. Find the domain of the first relation.

   The domain is the set of *x*-values of the relation. List the domain in numerical order. If any of the values repeat, list them only once.

   Domain: {–2, –1, 0, 1, 2, 3}

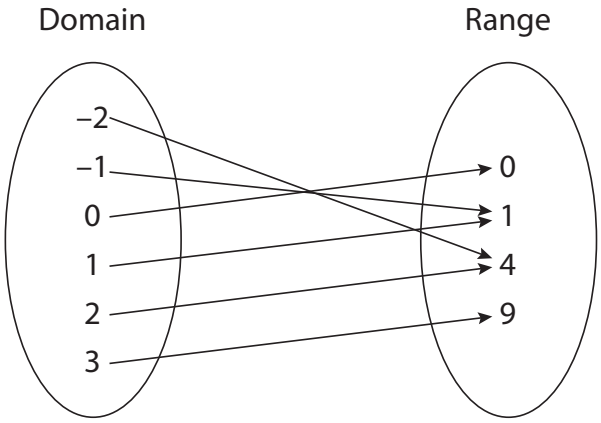
2. Find the range of the relation.

   The range is the set of *y*-values of the relation. List the range in numerical order. If any of the values repeat, list them only once.

   Range: {0, 1, 4, 9}

   The *y*-values 1 and 4 each appear in more than one of the ordered pairs, but they are only listed once.

3. Map the elements in the domain to the corresponding elements in the range.



4. Analyze the mapping.

   If there is only one line coming from each element of the domain, the relation is a function. In this case, each element of the domain is paired with exactly one element in the range, so the relation is a function. Notice that some elements in the range have two arrows coming to them. The relation is still a function because each element in the domain has only one line from it.

Example 2

Is the relation below a function? Use a mapping diagram to determine your answer.

{(4, –5), (1, –3), (0, 0), (1, 1), (4, 5), (9, 3)}

1. Find the domain of the relation.

   The domain is the set of *x*-values of the relation. List the domain in numerical order. List repeating values only once.

   Domain: {0, 1, 4, 9}

   1 and 4 repeat, but they are only listed once.

2. Find the range of the relation.

   The range is the set of *y*-values of the relation. List the range in numerical order. List repeating values only once.

   Range: {–5, –3, 0, 1, 3, 5}

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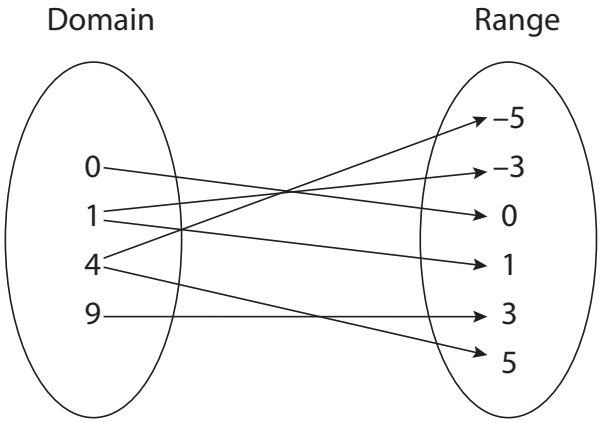
3. Map the elements in the domain to the corresponding elements in the range.



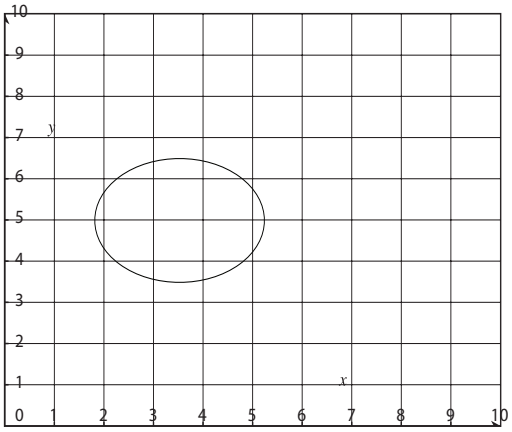
4. Analyze the mapping.

If there is only one line coming from each element of the domain, the relation is a function. In this case, two elements of the domain have multiple lines going to elements in the range. The relation is not a function.

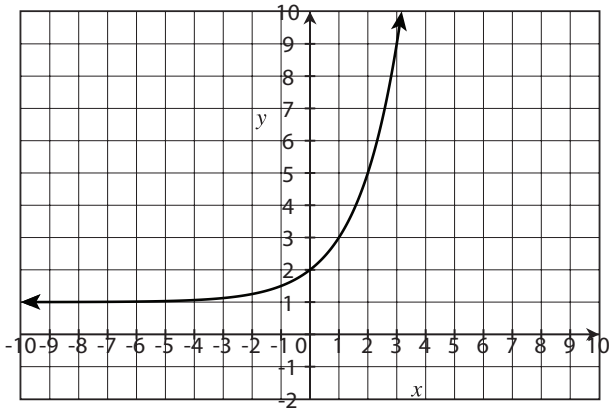
Example 3

Use the vertical line test to determine if each relation is a function.

Graph A



Graph B



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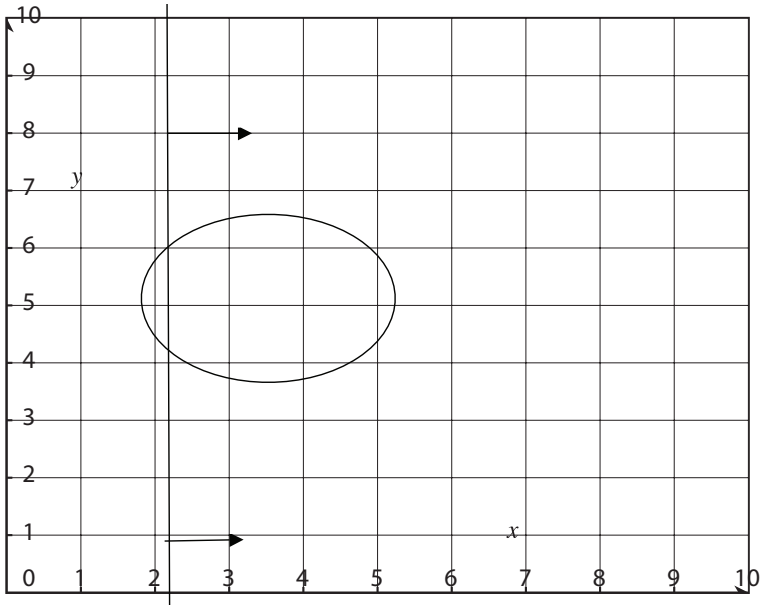
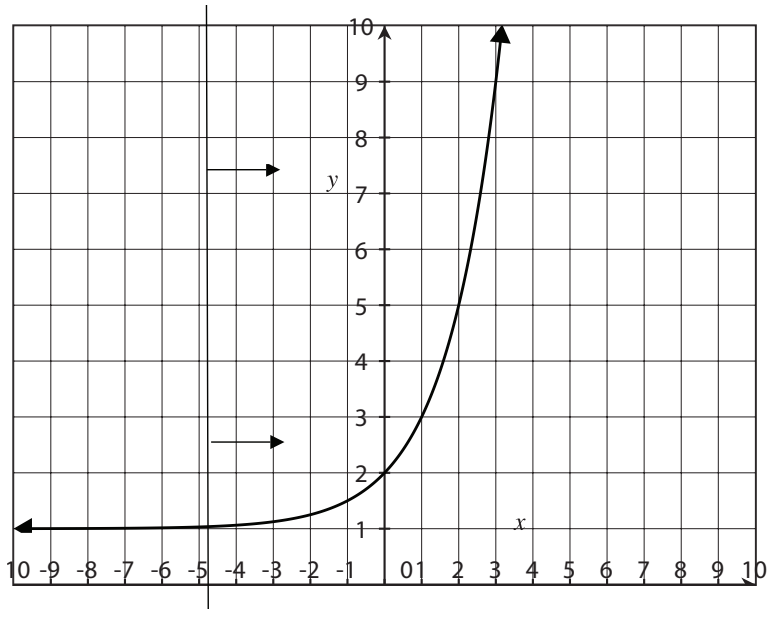
1. Pass a vertical line over the figure in Graph A. Notice that the line crosses two points on the figure at the same time. The relation is not a function.



2. Pass a vertical line over the curve in Graph B. Notice that at any time the vertical line only crosses 1 point on the curve at a time. The relation is a function.



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Example 4

Omar has decided to take yoga classes for one year. The yoga studio costs $10 to join and then each yoga class is $5. Omar's fees can be represented by the function $f(x) = 5x + 10$. What are the domain and range of the function?

1. Identify the domain.

   The domain is the set of x-values that are valid for the function. Omar can take 0, 1, 2, 3, 4, ... etc., classes up to infinity. However, it is unlikely that Omar would take any more than 1 yoga class per day. If Omar never takes a class, the lowest value in the domain would be 0. If Omar takes a class every day for a year, the highest value in the domain would be 365.

   Domain: {0, 1, 2, 3, ..., 363, 364, 365}

2. Identify the range.

   The range is the values of y that are valid for the function. The y-values will be the solutions to the function when the domain is substituted. The function is $f(x) = 5x + 10$. Substitute domain values for x in the function to find values for the range.

   Range: {10, 15, 20, 25, 35, ..., 1825, 1830, 1835}

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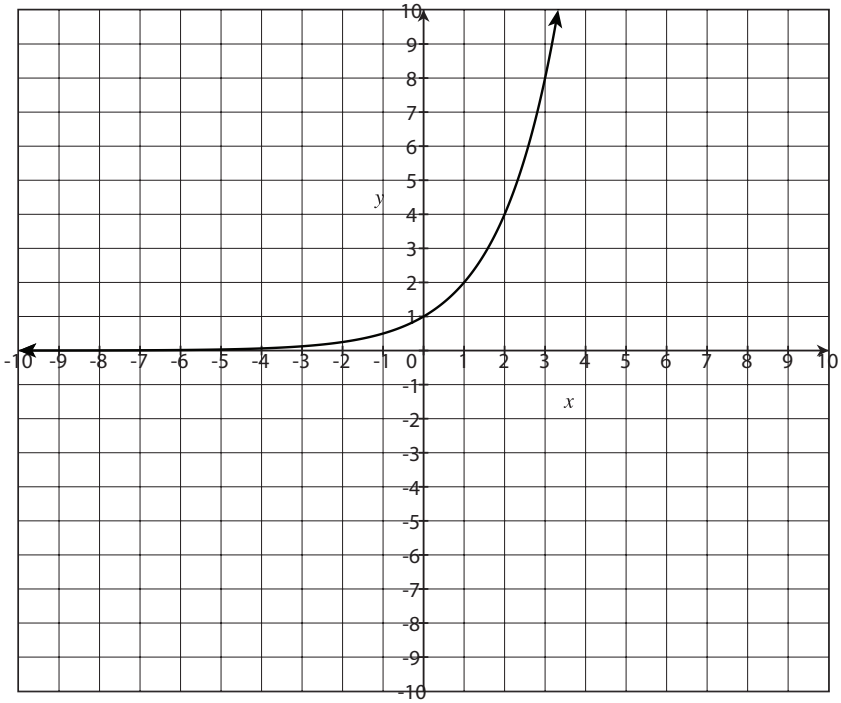
Example 5

Identify the domain and range of the function $f(x) = 2^x$. Use the graph below.



1. Identify the domain.

   The domain is the set of x-values that are valid for the function. This graph goes on infinitely; so, the domain can be any real x-value.

   Domain: {all real numbers}

2. Identify the range.

   The range is the set of y-values that are valid for the function.

   The range will never go below 0. In fact, the range never actually reaches 0. The upper end of the range, however, is limitless.

   Range: $\{x > 0\}$