Two of the most important characteristics to understand about a function are its **domain** and **range**. They give you the outline of the function's story, and this helps you primarily with troubleshooting (like figuring out why nothing is showing up in the window of your graphing calculator). Let's look at domain a few different ways first…

The domain is the set (or group) of all possible inputs or *x*-values of your function. Most of the functions you have dealt with to this point in your education have had a domain of *all real numbers*, so you maybe haven't given the domain much thought. Let's start with a basic example… a function defined by the four points

$$\{(4, 2),\ (5, -3),\ (7, 1),\ (3, -6)\}$$

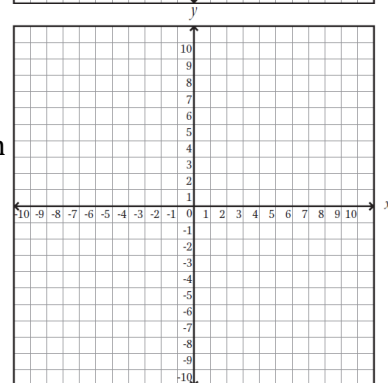1. What is the domain of this function?

2. What is the range of the function?

3. Graph the function on the grid.
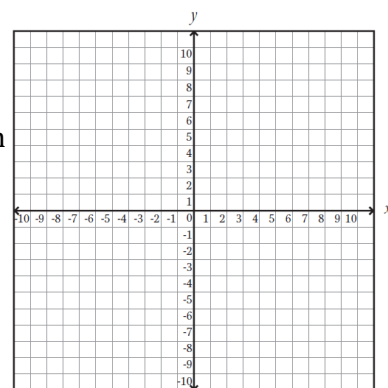
One more easy example…

$$\{(4, 2),\ (5, -3),\ (7, 2),\ (3, -6)\}$$

4. What is the domain of this function?

5. What is the range of the function?

6. Graph the function on the grid.

7. **What is the difference in the two examples?**

The two basic examples seem very similar, no? There is actually a very subtle, but important, difference between these two functions: one of them is **one-to-one** (1:1) and one of them is not. Remember a 1:1 function has *a unique output for each input*, which is just a fancy way of saying outputs do not repeat. Numerically, if you are working with a function comprised of coordinate pairs, you can see this by noticing the 1:1 ratio when comparing the amount of values in the domain to the amount in the range. You can test for 1:1-ness graphically using the **horizontal line test**, which works the same as the vertical line test you use to test whether a relation is a function. If there is any place in your function you can draw a horizontal line and cross the function more than once, then your function fails the HLT and is not 1:1.

8. Which of the examples above is a 1:1 function?

9. [Unrelated, but good review] Create a new list of four points that is not a function at all.

Determine whether the relation shown below is a function and if it is 1:1.

10. {(3, 4), (4, –6), (5, –7), (3, 2), (–2, 5)}   11. {(–5, 1), (–3, 0), (–1, 2), (0, 3)}

12.

13.

14.

15.

16.

17.

18.

19.
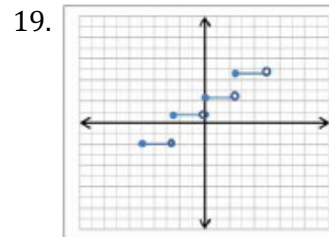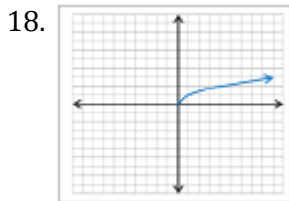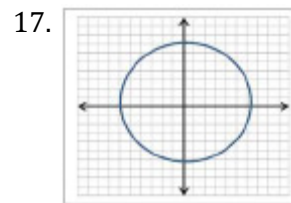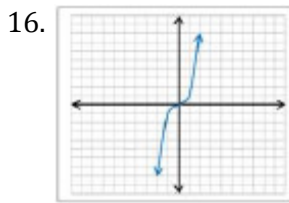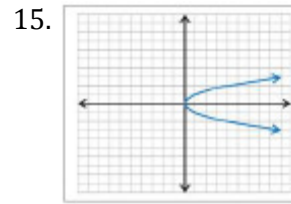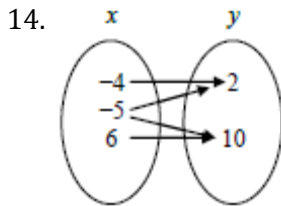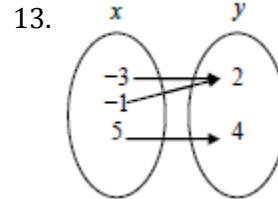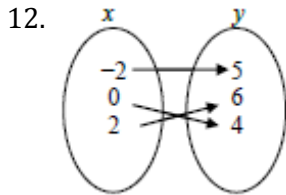
20. $y = |x - 4|$ 21. $x = \sqrt{y}$

22. Is human weight a function of height? Why or why not?

23. Is the height of a kicked soccer ball a function of time since the kick? Why or why not?