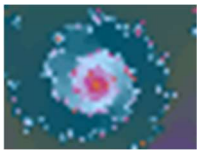
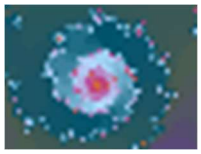


4-1: Functions



*A **function** is a rule that assigns to every element in a set D (**domain**) exactly one element in the set R (**range**). We will treat functions as a set of ordered pairs (x,y) where x is in the domain and y is in the range with*

$y = f(x)$.

Finding the domain of a function from its rule is not difficult. Look at the examples below carefully.

1) Give the domain of each.

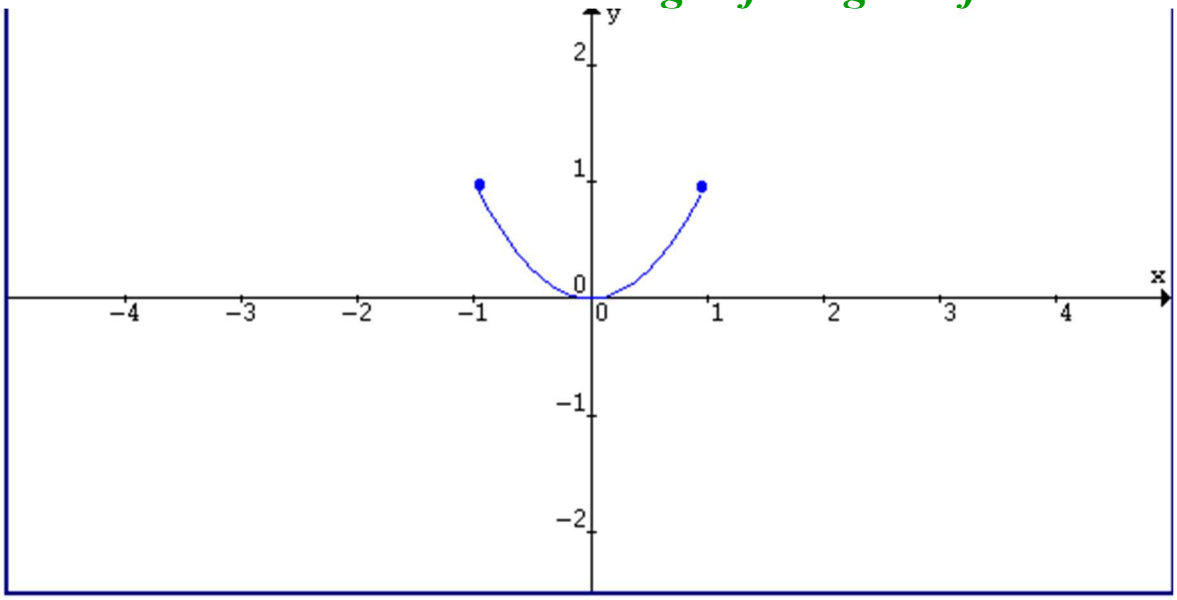
a) $f(x) = 3/(x - 5)$ *The domain consists of all numbers for x that are defined for the function. Since the function doesn't exist at x = 5 (it makes the denominator 0), the domain is all real numbers but 5.*

b) $f(x) = \sqrt{4 - x}$ *Since 4 - x is under the radical, 4 - x must be greater than or equal to zero, otherwise the answers will be imaginary. To find the domain, solve the inequality* $4 - x \geq 0$.

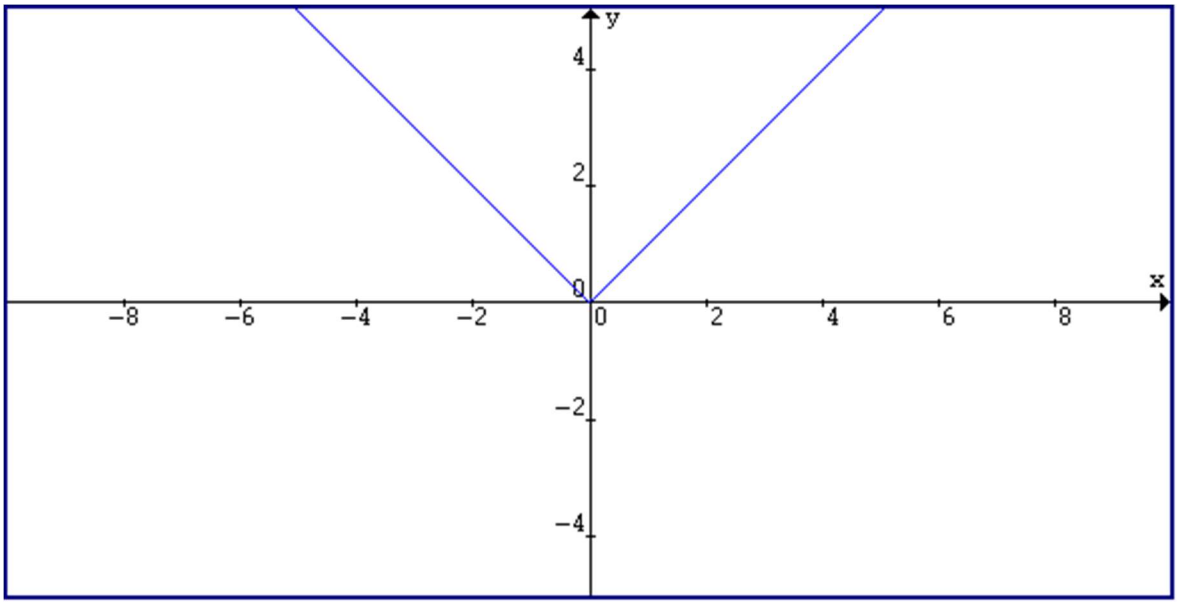
$-x \geq -4$

$x \leq 4$. *Thus, all numbers less than or equal to 4 represent the domain for this function.*

When trying to find the domain and range from a graph, the domain is found by looking at the graph from left to right. The range is found by looking at the graph from top to bottom. Find the domain and range of the given functions.

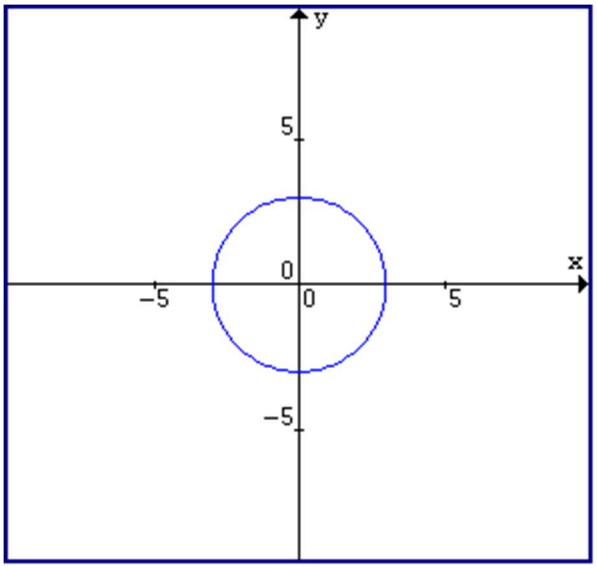


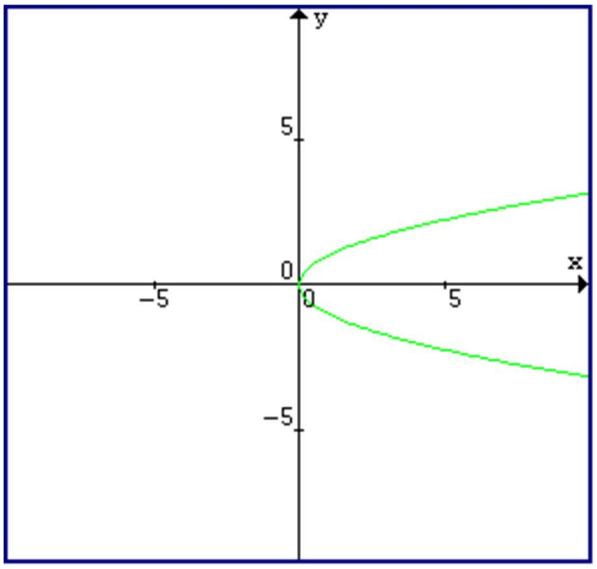
Look at the graph from left to right. For the x values, they start at -1 and end at 1. So the domain is $-1 \leq x \leq 1$. Look at the graph from top to bottom. The high point is 1 and the low point is 0. Thus the range is $0 \leq y \leq 1$.



The graph above has a domain that is all real numbers. It doesn't stop to the right or the left. The range of the function is y ≥0. The low point is zero and it has no high point.

To determine if a graph is a function or not, we can use the vertical line test. If no vertical line crosses a graph more than once, then the graph is a function.
Study the graphs below and determine if they are functions.


y
5
0
x
−5
0
5
−5


y
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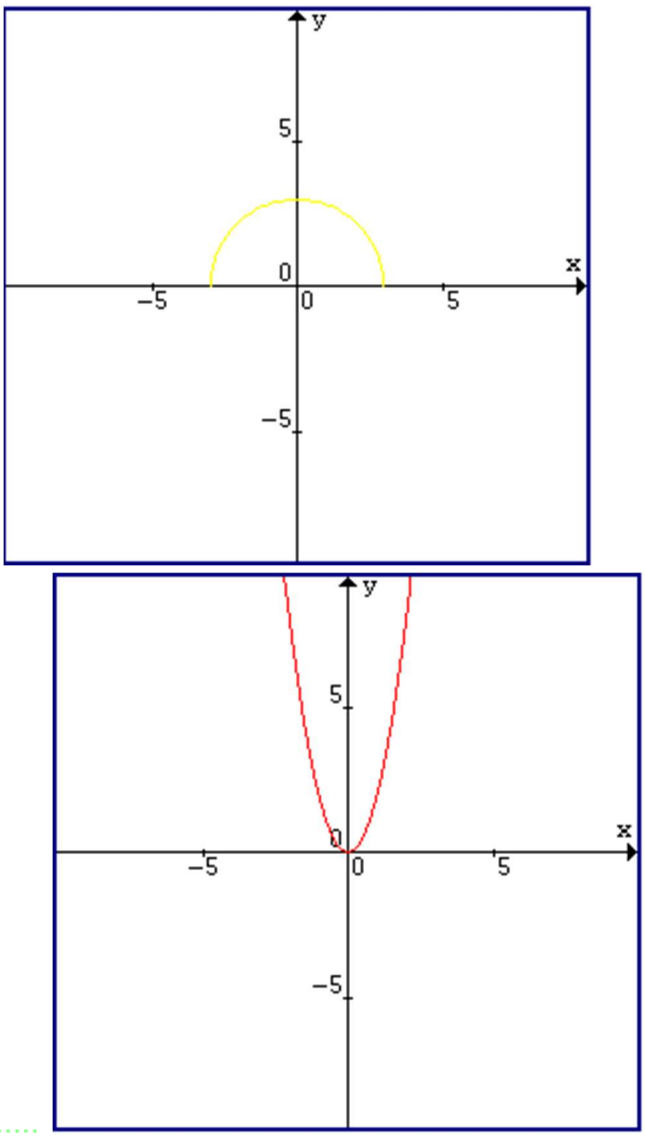
0
x
−5
0
5
−5



The top two are not functions because a vertical line passed through the graphs will cross the circle and parabola twice. The bottom two are functions because vertical lines passed anywhere through these graphs will only cross once.

When working with functions, the x variable is the independent variable and f(x) is the dependent variable. The function depends on the values you pick for the x value!!