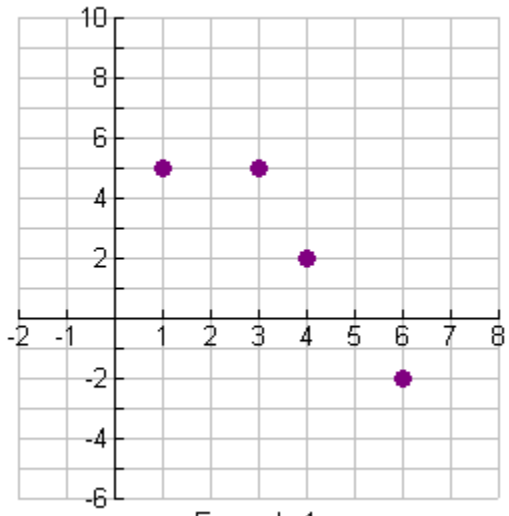
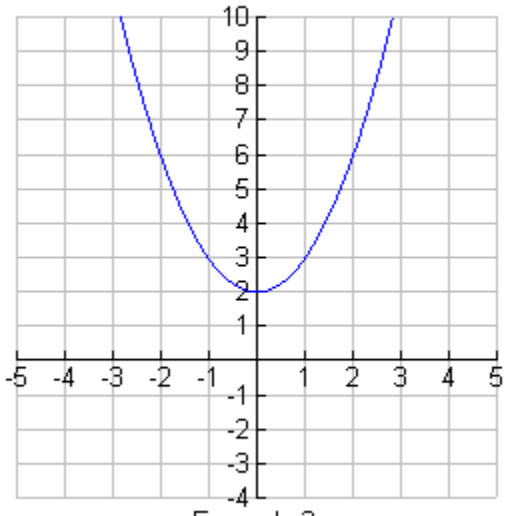
# Graphing, Domain and Range of Functions

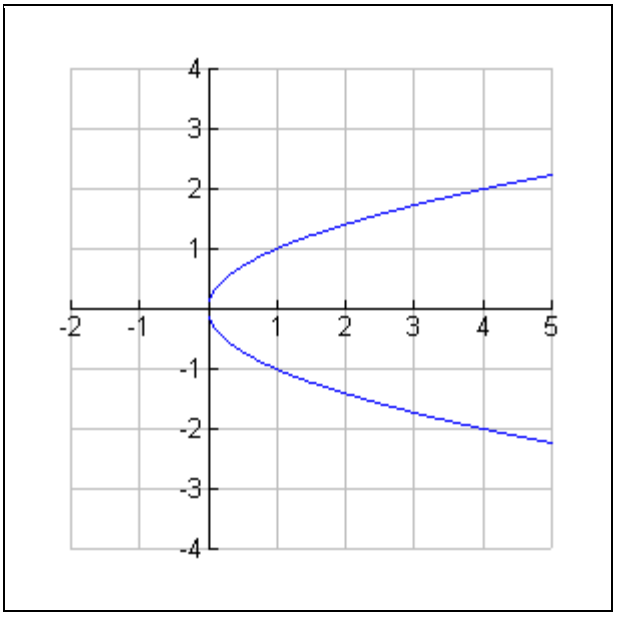


The domain is the set of all first elements of ordered pairs (*x*-coordinates).
The range is the set of all second elements of ordered pairs (*y*-coordinates).

Domain and range can be seen clearly from a graph.

| **Example 1:** | **Example 2:** |
|---|---|
| $\{(3,5),(4,2),(6,-2),(1,5)\}$<br>Domain: {1, 3, 4, 6}<br>Range: {-2, 2, 5}<br>  <br>Example 1 | $y = x^2 + 2$<br>Domain: $\mathbb{R}$ (all real numbers)<br>Range: $y \geq 2$<br>  <br>Example 2 |

The two examples shown above are functions. But, as we know, not all graphs are functions.



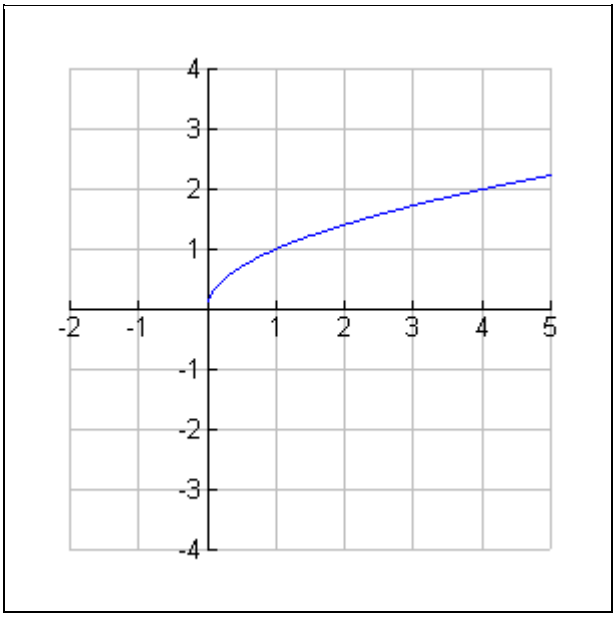

The graph at the left is: $f(x) = \pm\sqrt{x}$

Since the graph **FAILS** the Vertical Line Test, this relation is not a function.

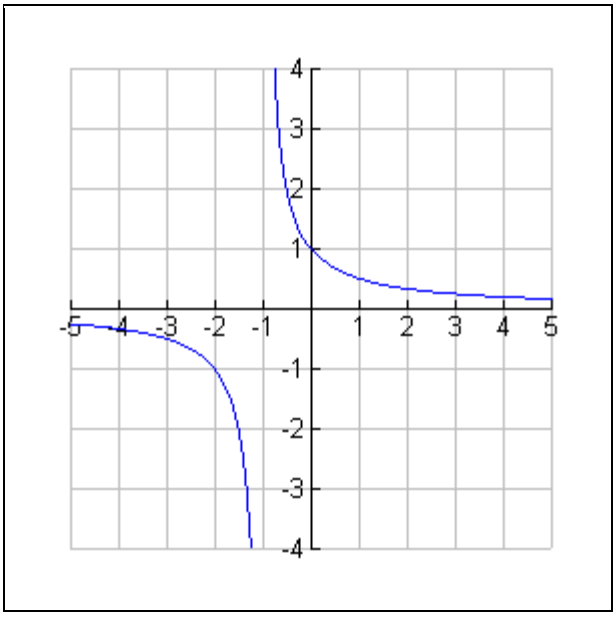
If we **restrict the graph** to only the "positive" (or we could have chosen negative) *y*-values, the graph will be a function:

$f(x) = +\sqrt{x}$ (graph below)

Now, this graph passes the Vertical Line Test.




In a similar fashion, we can also **restrict domains** to ensure that graphs are functions.




The graph at the left is: $f(x) = \frac{1}{x+1}$

If the domain for this graph is listed as "all Real numbers", this relation is **NOT** a function. At first glance this graph appears to pass the Vertical Line Test, but it is actually undefined at $x = -1$.

If we **restrict the domain** to be "all Real numbers excluding -1", our relation will be a function.

Domain: $\mathbb{R} - \{-1\}$