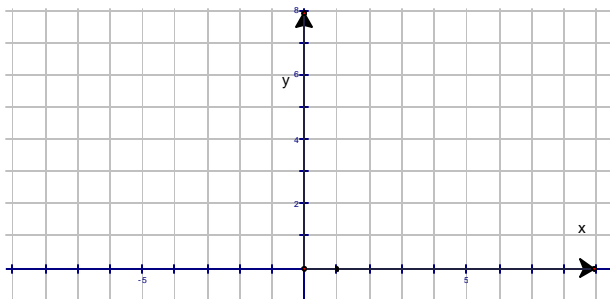


**2.6 Graphs of Basic Functions (Toolbox functions)**  
**2.7 Symmetries of a Graph; Even and Odd Functions**  
**2.6 Piecewise-Defined Functions**

**Constant Function**  $f(x) = k, k \in \mathbb{R}$



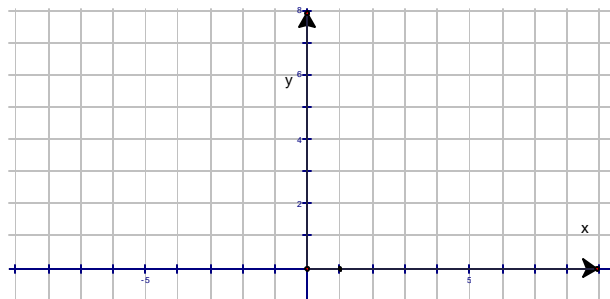
Domain:                      Range:

Intercepts:

Increasing / Decreasing:

Constant:

**Square Function**  $f(x) = x^2$



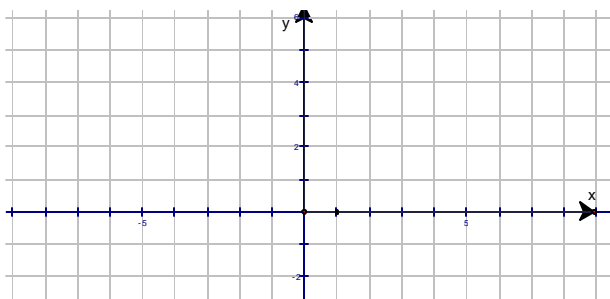
Domain:                      Range:

Intercepts:

Increasing / Decreasing:

Constant:

**Identity Function**  $f(x) = x$



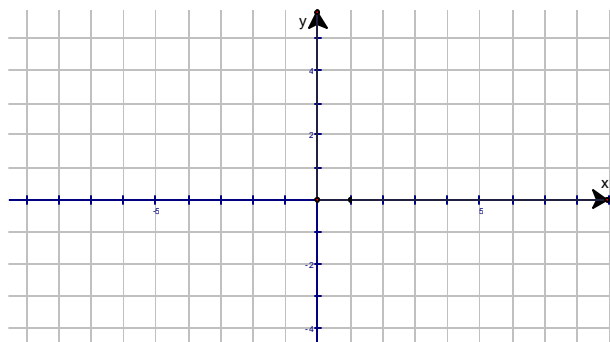
Domain:                      Range:

Intercepts:

Increasing / Decreasing:

Constant:

**Cube Function**  $f(x) = x^3$



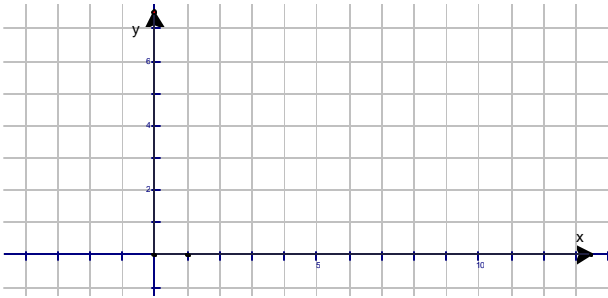
Domain:                      Range:

Intercepts:

Increasing / Decreasing:

Constant:

**Square Root Function**  $f(x) = \sqrt{x}$



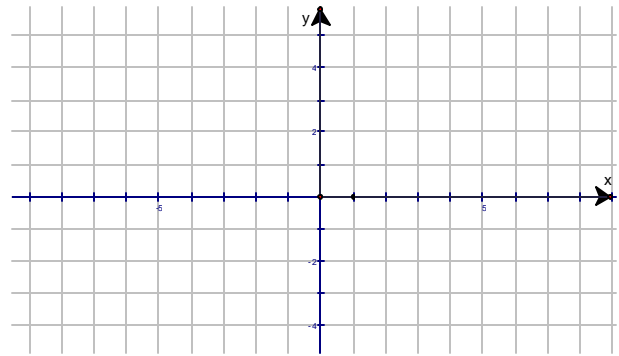
Domain:                      Range:

Intercepts:

Increasing / Decreasing:

Constant:

**Reciprocal Function**  $f(x) = \frac{1}{x}$



Domain:                      Range:

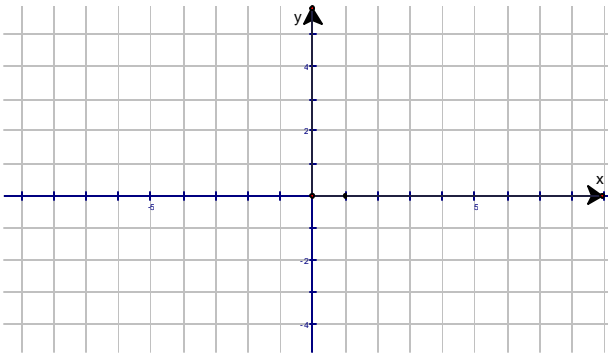
Intercepts:

Increasing / Decreasing:

Constant:

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**Cube Root Function**  $f(x) = \sqrt[3]{x}$



Domain:                      Range:

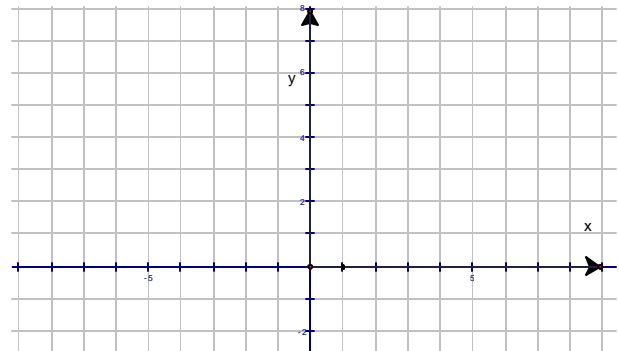
Intercepts:

Increasing / Decreasing:

Constant:

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**Absolute Value Function**  $f(x) = |x|$



Domain:                      Range:

Intercepts:

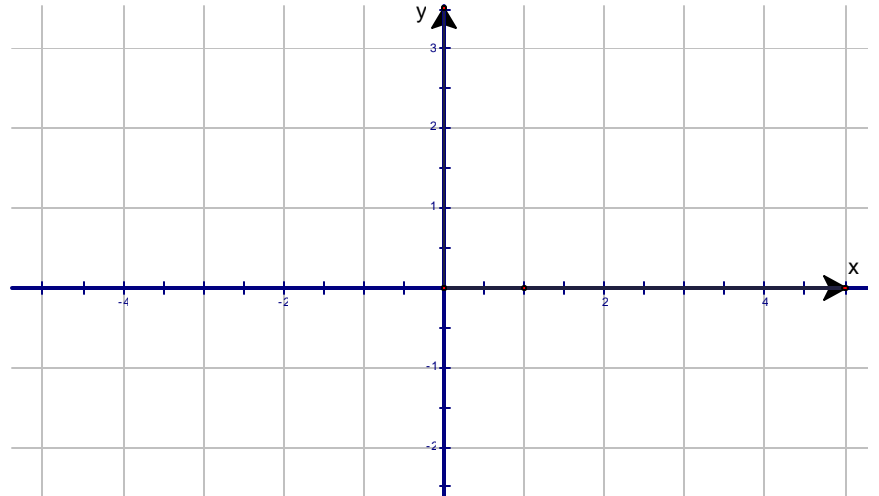
Increasing / Decreasing:

Constant:

## Greatest Integer Function

$$f(x) = \text{int}(x)$$

The greatest integer less than or equal to  $x$ .



Domain:

Range:

Intercepts:

Increasing / Decreasing:

Constant:

## Graphs and Symmetry (2.5)

Definition 1 A **graph is symmetric about the y-axis** if and only if , given any point  $(x, y)$  on the graph, the point  $(-x, y)$  is also on the graph.

Definition 2 A **graph is symmetric about the x-axis** if and only if , given any point  $(x, y)$  on the graph, the point  $(x, -y)$  is also on the graph.

Definition 3 A **graph is symmetric about the origin** if and only if , given any point  $(x, y)$  on the graph, the point  $(-x, -y)$  is also on the graph.

Definition 4 A **function is even** if and only if  $f(-x) = f(x)$ .

Definition 5 A **function is odd** if and only if  $f(-x) = -f(x)$

**Exercise 1** Determine whether the following functions are even, odd, or neither.

$$f(x) = -x^3 + 2x$$

$$g(x) = x^3 - x + 3$$

$$h(x) = x^2 - 1$$

**Exercise 2** Determine whether a graph is symmetric about the  $x$ -axis,  $y$ -axis, or the origin.

$$y = \frac{-5}{x^2}$$

$$x^2 + y^2 = 10$$

$$y = x^3 - x$$

**Exercise 3** Let  $f(x) = \begin{cases} \sqrt{x}, & \text{if } 0 \leq x < 1 \\ x^2, & \text{if } 1 \leq x < 3 \end{cases}$  a piecewise-defined function.

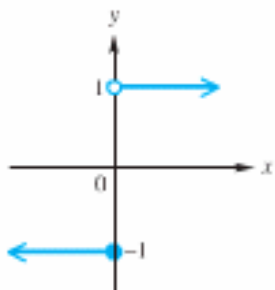
- Graph the function.
- Identify the domain and range.

**Exercise 4** Let  $f(x) = \begin{cases} 3-x, & \text{if } x < -1 \\ x^2, & \text{if } -1 \leq x \leq 2 \\ \sqrt{x}, & \text{if } x > 2 \end{cases}$  a piecewise-defined function.

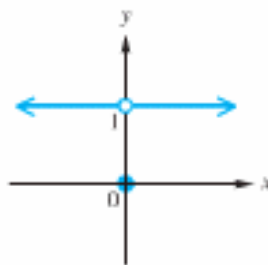
- Graph the function.
- Identify the domain and range.
- Identify the intercepts.
- Identify the intervals on which the function is increasing, decreasing, constant.

**Exercise 5** Give a rule for each piecewise-defined function.

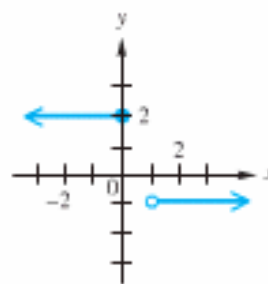
35.



36.



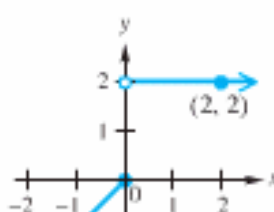
37.



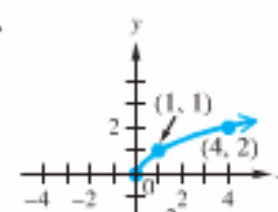
38.



39.



40.



**Exercise 6** At Wet Willy's Water World, infants under 2 are free, then admission is charged according to age. Children 2 and older but less than 13 pay \$2, teenagers 13 and older but less than 20 pay \$5, adults 20 and older but less than 65 pay \$7, and senior citizens 65 and older get in at the teenage rate. Write this information in the form of a piecewise defined function and state the domain and range. Then sketch the graph of the function.