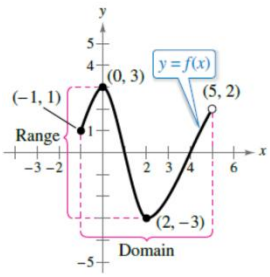
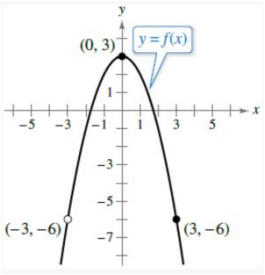
Functions and Their Graphs

- x = directed distance from the *y*-axis
- $f(x) = y$ = directed distance from the *x*-axis
- Domain –
- Range –





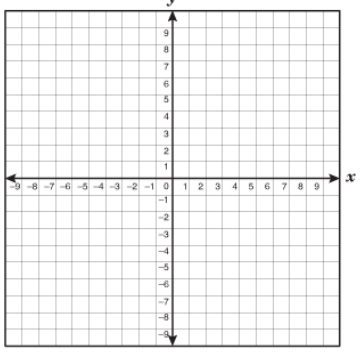
- Zero's of a Function – Where the function equals zero ($f(x) = 0$). Graphically, x-intercepts.
- Find the zero's of the following functions.
  - $f(x) = 2x^2 + 13x - 14$
  - $g(t) = \sqrt{t - 25}$
  - $f(x) = \frac{x^2-2}{x-1}$

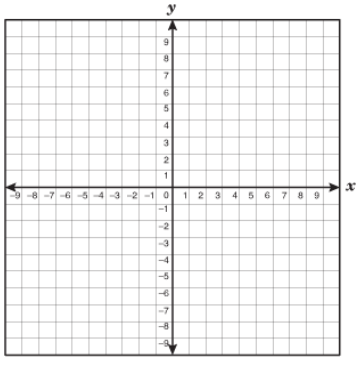
- Increasing and Decreasing Behavior of Functions
  - Graph $x^3 + 3x^2 - 1$, then determine the open intervals that the function is increasing, decreasing, or constant.

- Relative Minimum and Maximums of Functions
  - Use a graphing utility to determine the relative maximum of $f(x) = -4x^2 - 7x + 3$.

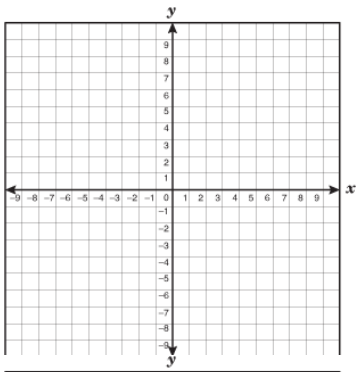
- Even and Odd Functions: Directly related to symmetry tests.
  - Even: Symmetric to *y*-axis. $f(-x) = f(x)$
  - Odd: Symmetric to origin. $f(-x) = -f(x)$
  - EX: Determine whether the following functions are even, odd, or neither.
    - $f(x) = 5 - 3x$
    - $f(x) = x^4 - x^2 - 1$
    - $f(x) = 2x^3 + 3x$

- Parent functions basics
  - EX: Write the linear function *f* for which $f(-2) = 6$ and $f(4) = -9$, and then graph and describe.
  - EX: Graph and describe: $f(x) = y = x^2$

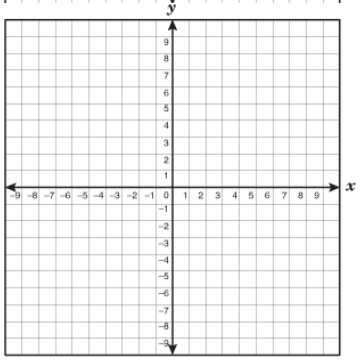


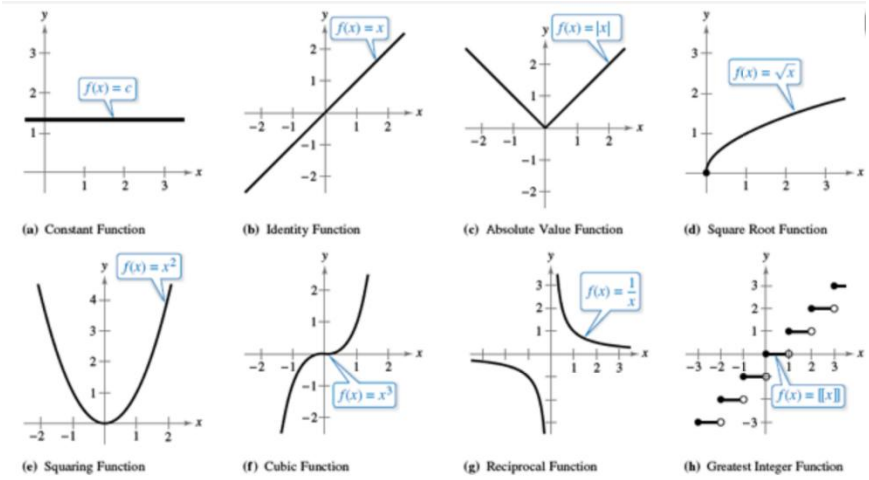


- EX: Graph and describe: $f(x) = x^3$



- EX: Graph and describe: $f(x) = \frac{1}{x}$





(a) Constant Function (b) Identity Function (c) Absolute Value Function (d) Square Root Function

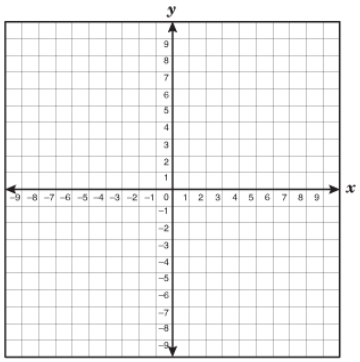
(e) Squaring Function (f) Cubic Function (g) Reciprocal Function (h) Greatest Integer Function

- Transformations of the parent functions
  - Increasing *a*, narrows graph; Decreasing *a*, widens graph
  - *a* positive = up; *a* negative = down
  - *h* shifts graph left and right
  - *k* shifts graph up and down

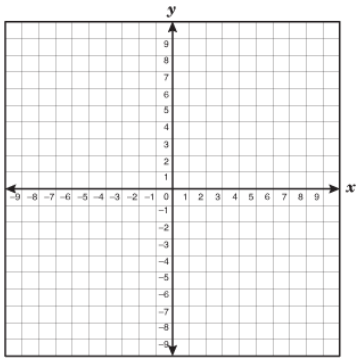
- EX: Use the parent function $f(x) = x^3$ to describe the transformation in the following:
  - $f(x) = x^3 + 5$

  - $h(x) = -(x-2)^3 - 1$

- Describe the transformation of $f(x) = \sqrt{x+1}$ and graph.



- EX: Use the parent function $f(x) = |x|$ to describe the transformation in the following:
  - $f(x) = \frac{1}{2}|x|$



  - $h(x) = 2|x-1| + 2$