11.1 Additional Graphs of Functions

OBJECTIVES:

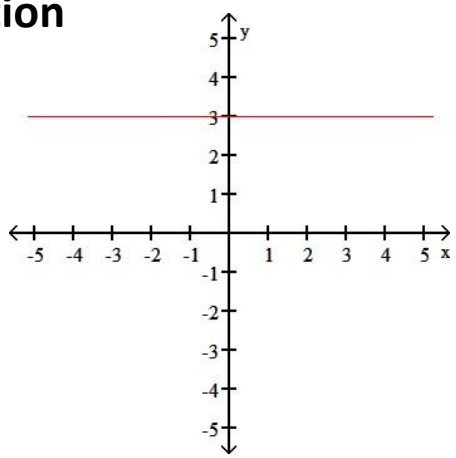
- Recognize the graphs of elementary functions defined by $|x|$, $\frac{1}{x}$, and $\sqrt{x}$ and graph their translations.
- Recognize and graph step functions.

Written by: Cindy Alder

Parent Functions

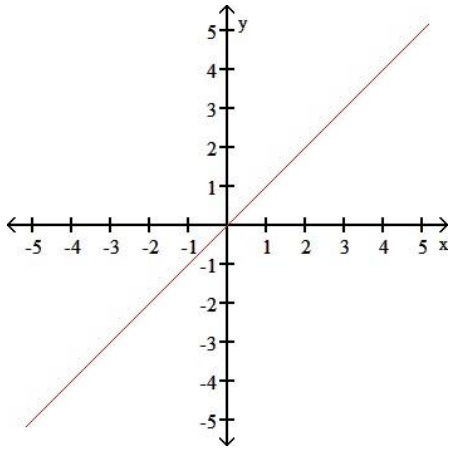
Constant Function

$f(x) = a$



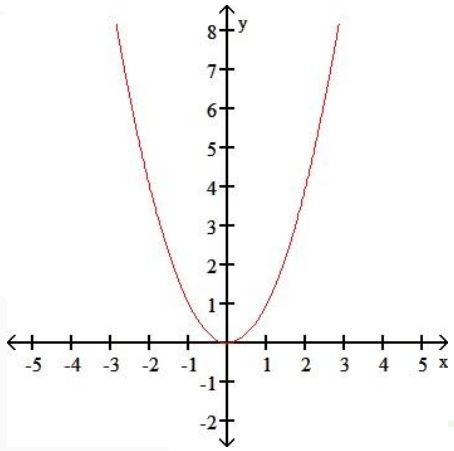
Linear Function

$f(x) = x$



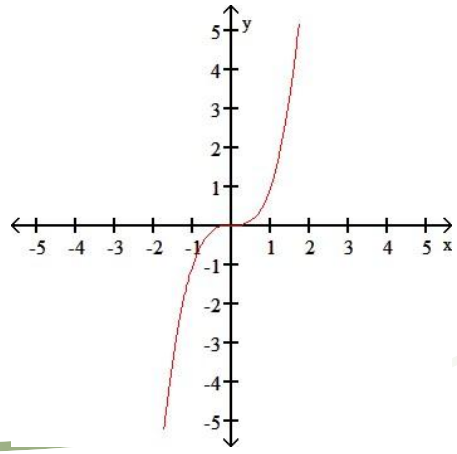
Quadratic Function

$f(x) = x^2$



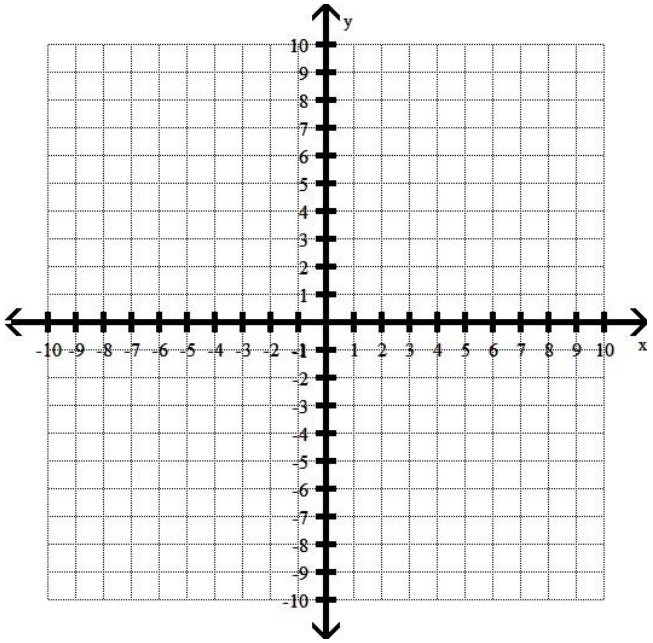
Cubic Function

$f(x) = x^3$



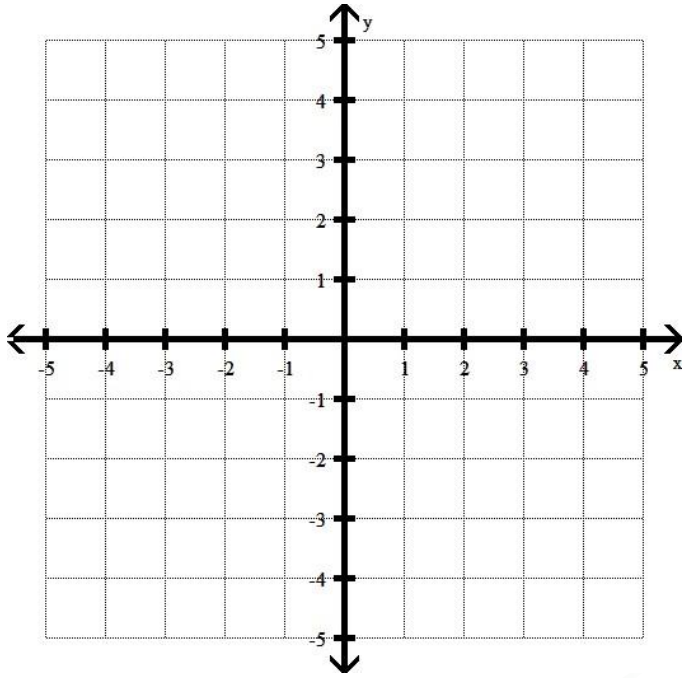
Absolute Value Function

- The **absolute value function** is another elementary function defined by $f(x) = |x|$. This function pairs each real number with its absolute value. Graph this function and give the domain and range.



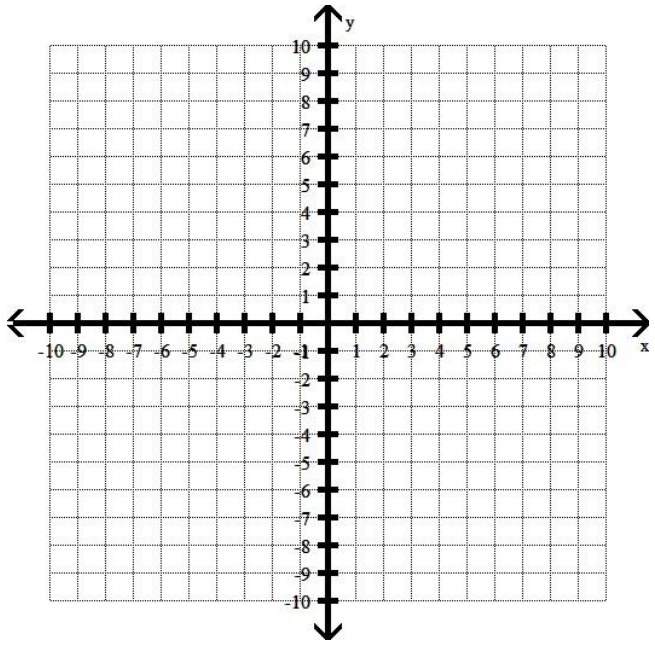
Reciprocal Function

- The **reciprocal function** is another elementary function defined by $f(x) = \frac{1}{x}$. Graph this function and give the domain and range. *(This function was introduced in Section 7.4)*



Square Root Function

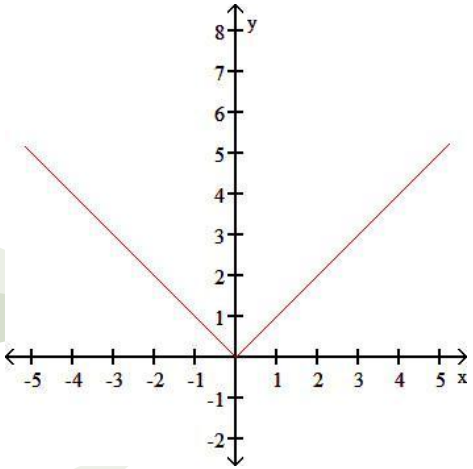
- The **square root function** is another elementary function defined by $f(x) = \sqrt{x}$. Graph this function and give the domain and range. *(This function was introduced in Section 8.1)*



Parent Functions

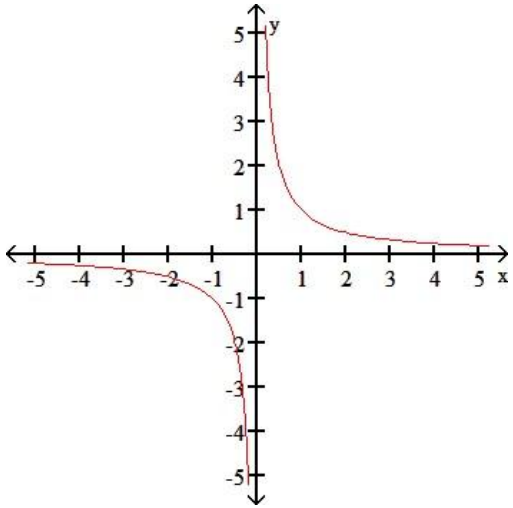
Absolute Value Function

$$f(x) = |x|$$



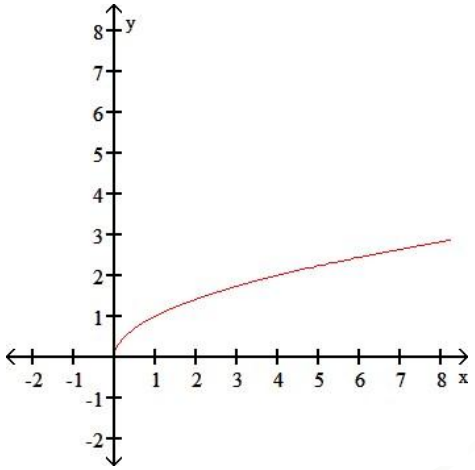
Reciprocal Function

$$f(x) = \frac{1}{x}$$



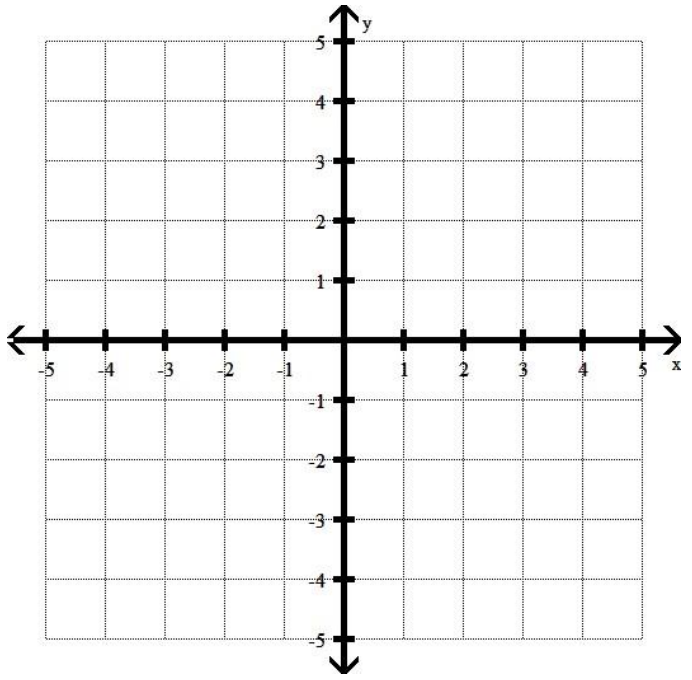
Square Root Function

$$f(x) = \sqrt{x}$$



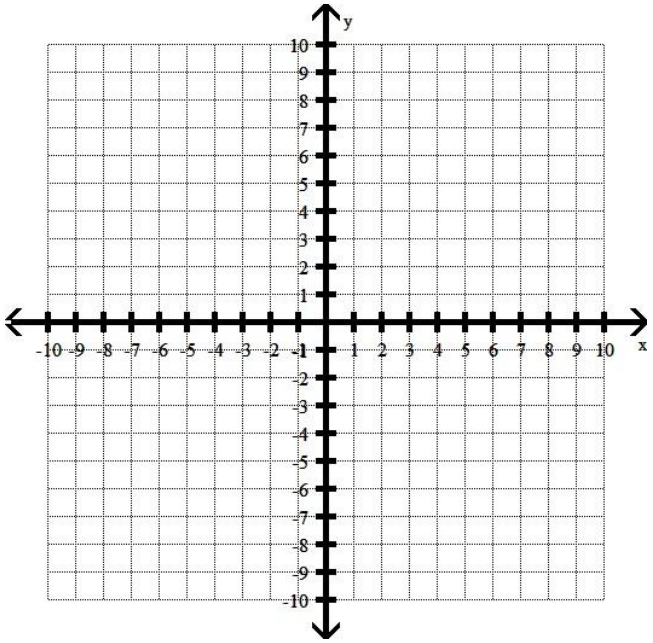
Applying a Vertical Shift

- Graph $f(x) = \frac{1}{x} + 3$. Give the domain and the range.



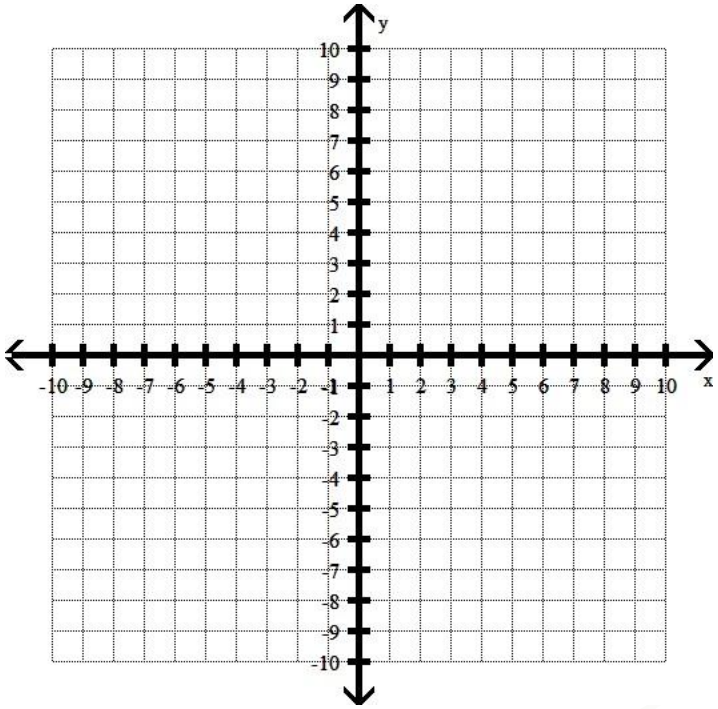
Applying a Horizontal Shift

- Graph $f(x) = \sqrt{x+4}$. Give the domain and the range.



Applying Both Horizontal and Vertical Shifts

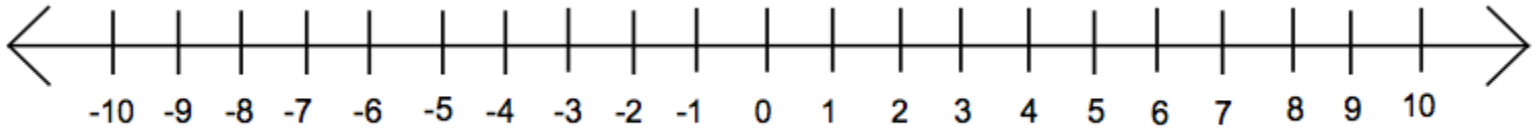
- Graph $f(x) = |x - 2| + 1$. Give the domain and the range.



Greatest Integer Function

$f(x) = [\![x]\!]$

The **greatest integer function,** written $f(x) = [\![x]\!]$, pairs every real number x with the greatest integer less than or equal to x.



Evaluate each expression.

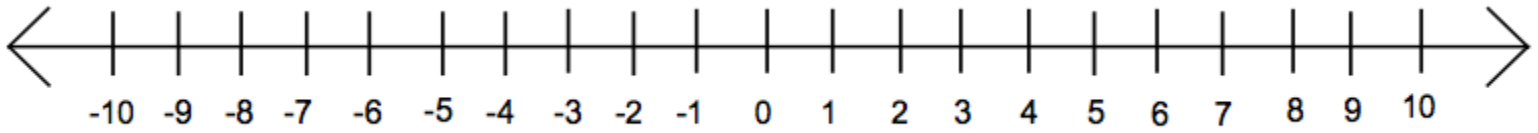
a) $[\![5]\!]$

b) $[\![-6]\!]$

c) $[\![3.5]\!]$

d) $[\![-4.1]\!]$

Greatest Integer Function



Evaluate each expression.

a) $[\![-1]\!]$

b) $[\![7.95]\!]$

c) $[\![4]\!]$

d) $[\![-9.1]\!]$

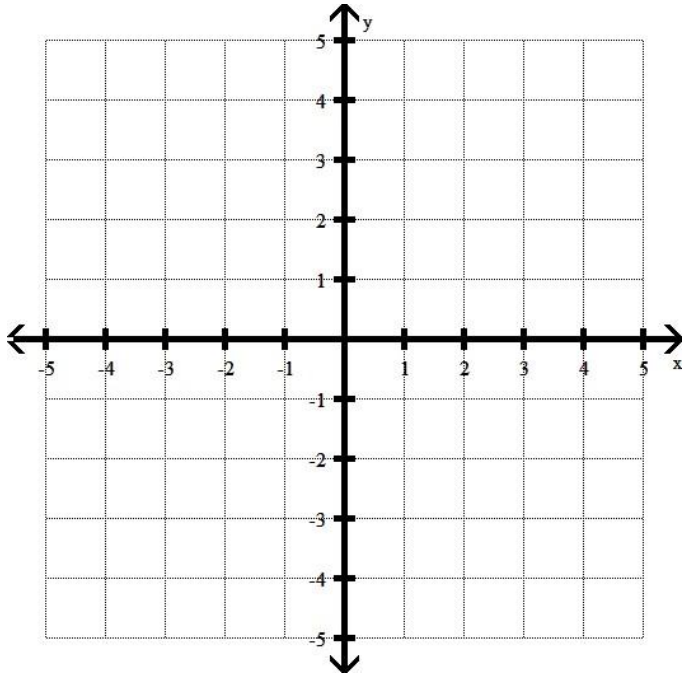
e) $\left[\!\left[\frac{7}{2}\right]\!\right]$

d) $[\![-2.6]\!]$

Graphing the Greatest Integer Function

- **Graph the function then give the domain and range:**

$$f(x) = [\![x]\!]$$



Graphing the Greatest Integer Function

- **Graph the function then give the domain and range :**

$$f(x) = [\![x]\!]$$

For $[\![x]\!]$,

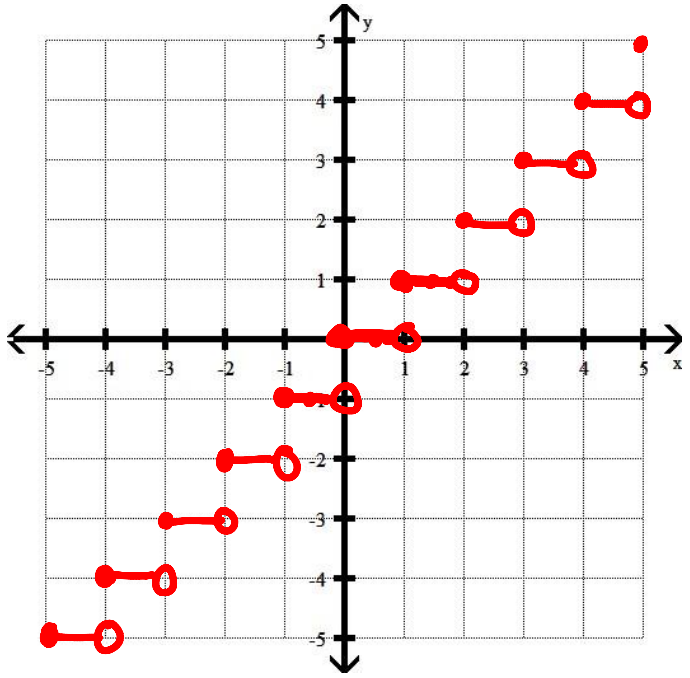
if $-1 \leq x < 0$, then $[\![x]\!] = -1$;

if $0 \leq x < 1$, then $[\![x]\!] = 0$;

if $1 \leq x < 2$, then $[\![x]\!] = 1$;

if $2 \leq x < 3$, then $[\![x]\!] = 2$;

if $3 \leq x < 4$, then $[\![x]\!] = 3$; and so on.

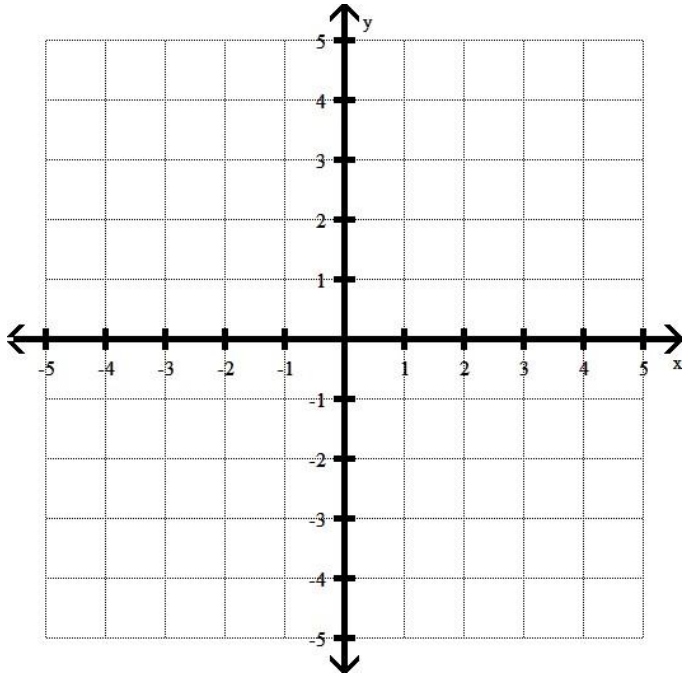


STEP FUNCTION

Graphing the Greatest Integer Function

- **Graph the function then give the domain and range :**

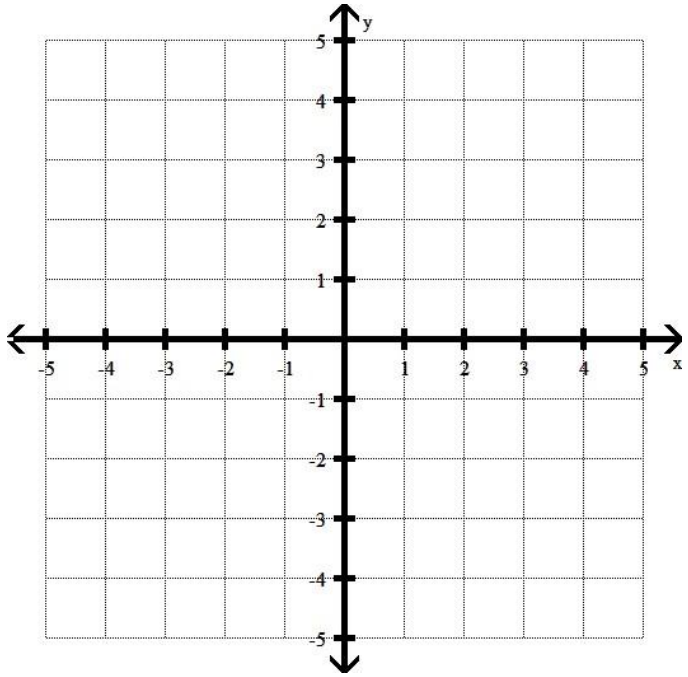
$$f(x) = [\![x + 1]\!]$$



Graphing the Greatest Integer Function

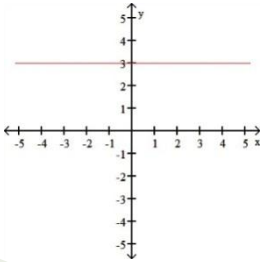
- **Graph the function then give the domain and range :**

$$f(x) = [\![x]\!] - 2$$

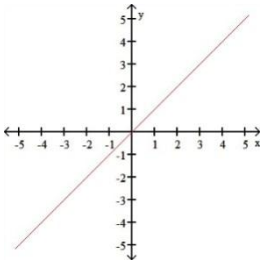


Parent Functions

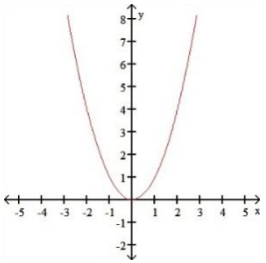
Constant Function
$f(x) = a$



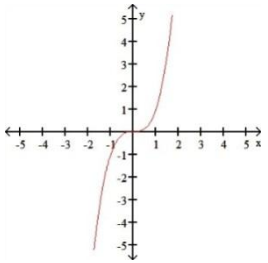
Linear Function
$f(x) = x$



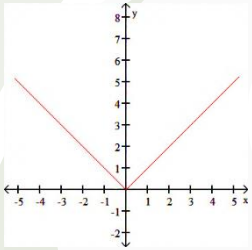
Quadratic Function
$f(x) = x^2$



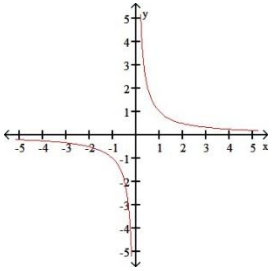
Cubic Function
$f(x) = x^3$



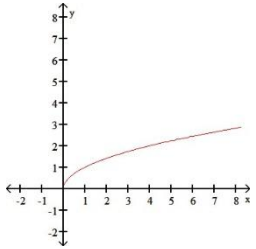
Absolute Value Function
$f(x) = |x|$



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



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



Greatest Integer Function
$f(x) = [\![x]\!]$