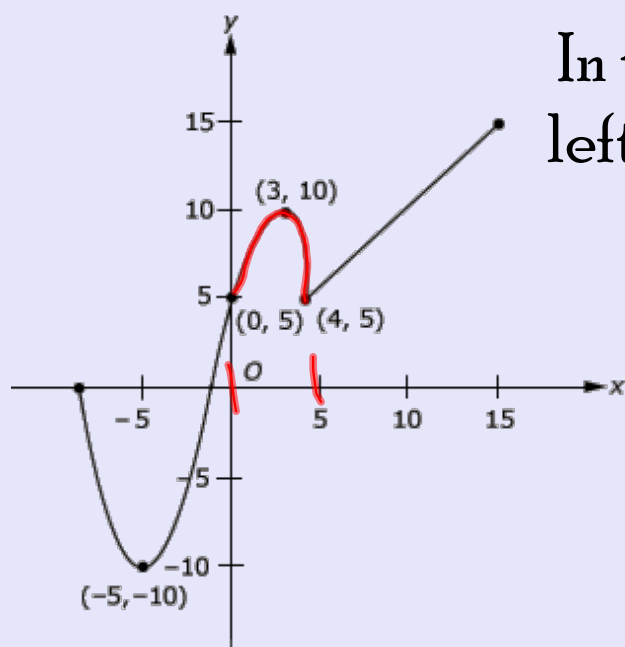



## SAT Question:



In the function shown to the left, if the domain of  $x$  is  $[0, 5]$  then what must be the range of  $y$ ?

## Function or Not?

### What is a function?


 <http://www.purplemath.com/modules/fcns.htm>

### Is the output unique?

Think of a job and the salary associated with job.

### Does it pass the Vertical Line Test?

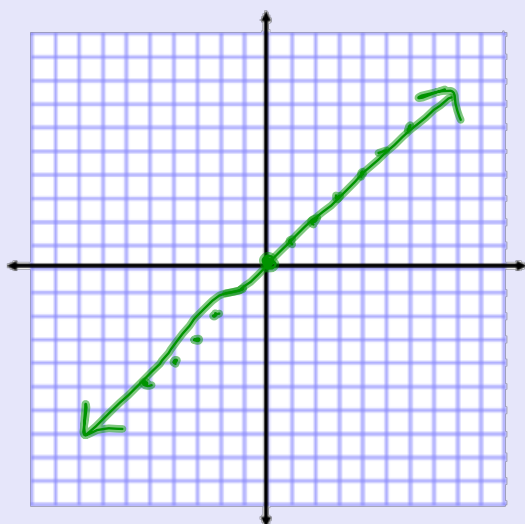
Vertical Line Test Practice

 <http://www.mathwarehouse.com/algebra/relation/vertical-line-test.php>

# The Basic Functions

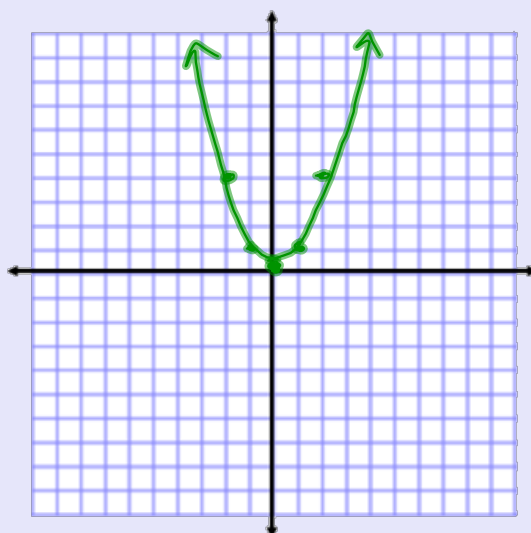
Linear function

$$y = x$$



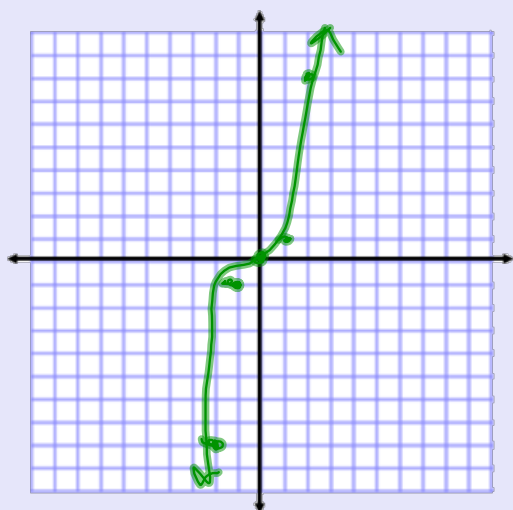
Quadratic Function

$$y = x^2$$



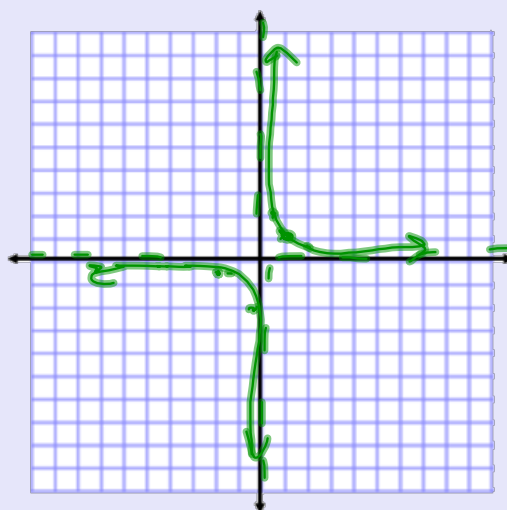
Cubic function

$$y = x^3$$



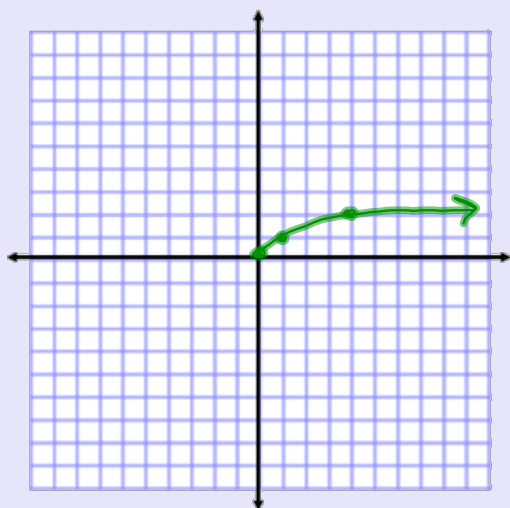
Rational Function

$$y = \frac{1}{x}$$



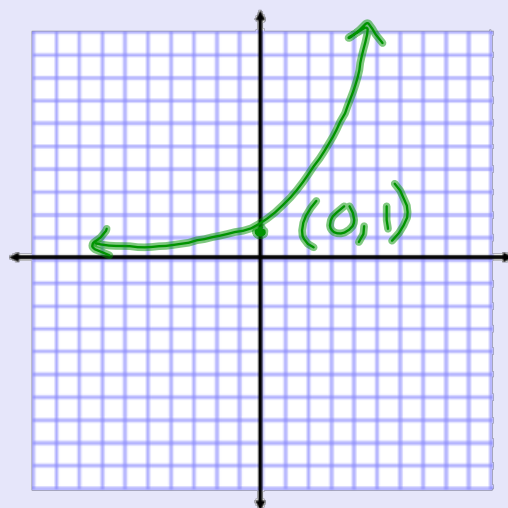
Square root function

$$y = \sqrt{x}$$

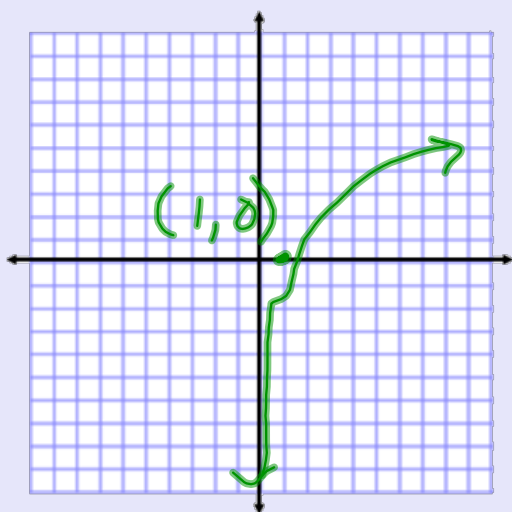


Exponential Function

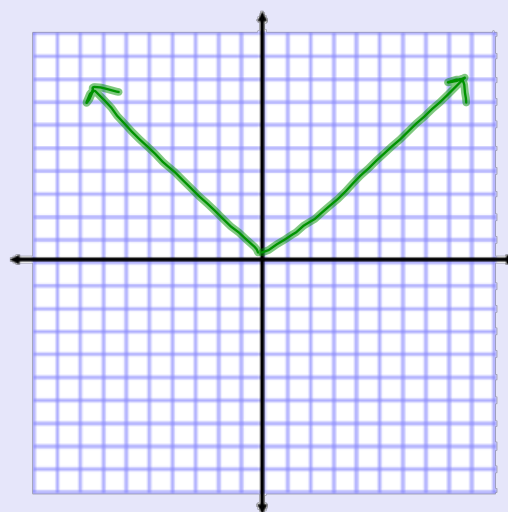
$$y = e^x$$



Logarithmic function  
 $y = \ln x$

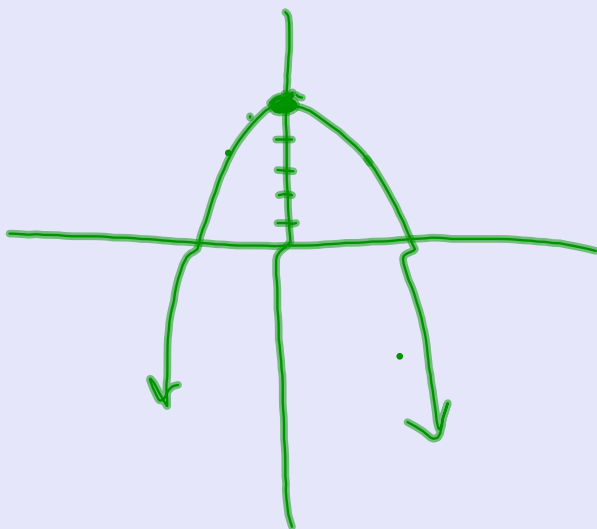


Absolute Value Function  
 $y = |x|$



Sketch each function and identify its characteristics.

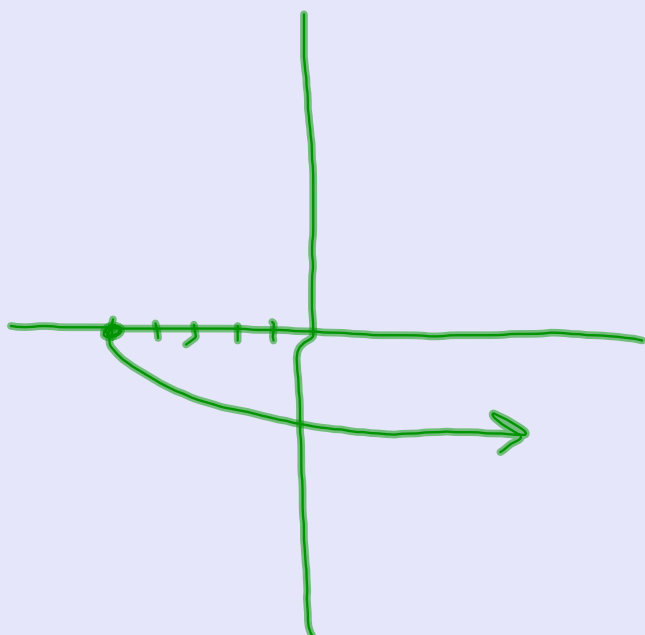
1.  $f(x) = -3x^2 + 5$



$(-\infty, \infty)$   
 $-\infty < x < \infty$   
 Domain:  $x \in \mathbb{R}$  Range:  $(-\infty, 5]$   
 $-\infty < y \leq 5$   
 Continuous or Not Continuous: Continuous  
 Local Max/Min: (0, 5)  
 Increasing on x interval:  $(-\infty, 0)$   
 Decreasing on x interval:  $(0, \infty)$   
 Symmetry: — Bounding: —  
 Asymptotes: none



2.  $f(x) = -\sqrt{x+5}$



Domain:  $[-5, \infty)$  Range:  $(-\infty, 0]$

Continuous or Not Continuous

Local Max/Min: \_\_\_\_\_

Increasing on x interval: never

Decreasing on x interval:  $[-5, \infty)$

~~Symmetry:~~ \_\_\_\_\_ ~~Bounding:~~ \_\_\_\_\_

Asymptotes: none

3.  $y = \frac{3x}{x-2}$

$$(-\infty, 2) \cup (2, \infty)$$

Domain:  $x \in \mathbb{R}, x \neq 2$  Range:  $y \in \mathbb{R}, y \neq 3$

Continuous or Not Continuous

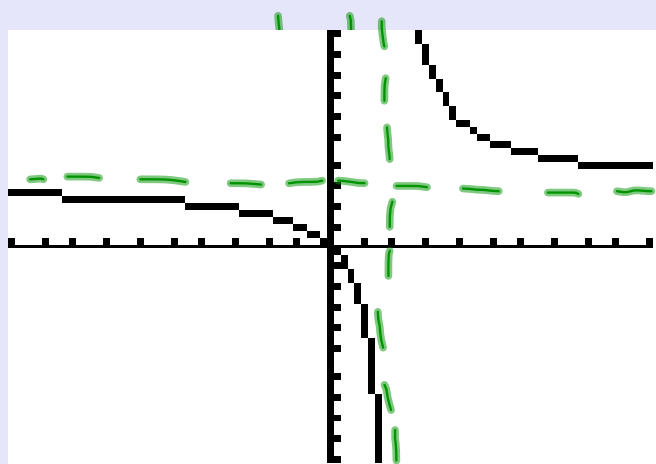
Local Max/Min: none

Increasing on x interval: never

Decreasing on x interval:  $x \in \mathbb{R}, x \neq 2$

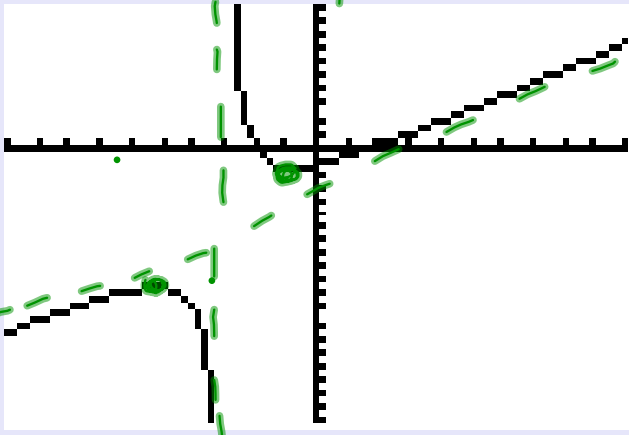
~~Symmetry:~~ ~~Bounding:~~

Asymptotes: VA:  $x=2$   
HA:  $y=3$



4.  $y = \frac{(x^2 - 4)}{(x + 3)}$

R



Domain:  $x \in \mathbb{R}, x \neq -3$  Range:  $(-\infty, -10.5) \cup (-1.53, \infty)$

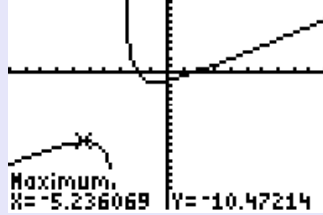
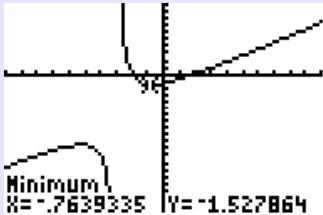
Continuous or Not Continuous  
 Local Max/Min: max:  $(-5.24, -10.5)$   
 min:  $(-1.764, -1.53)$

Increasing on x interval:  $(-\infty, -5.24) \cup (-0.764, \infty)$

Decreasing on x interval:  $(-5.24, -3) \cup (-3, -0.764)$

~~Symmetry:~~ ~~Bounding:~~

Asymptotes: VA:  $x = -3$   
 diagonal.



## Homework Assignment:

Page 172 (9-23, 29 odd)

Page 184-185 (9, 11, 19, 21, 37-45 odd)