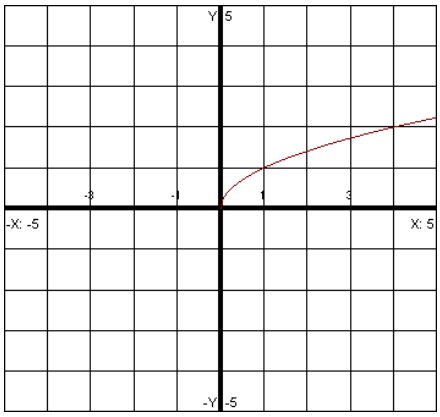
2.4 Library of Functions; Piecewise Functions

We will first look at a library of functions you should know how to sketch:



$y = \sqrt{x}$

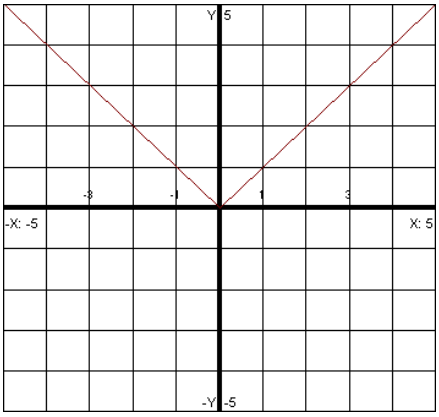
Square Root Function

Domain: $[0, \infty)$

Range: $[0, \infty)$

Increasing: $(0, \infty)$

Decreasing: None



$y = |x|$

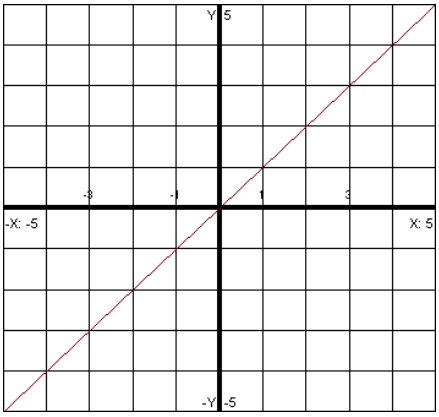
Absolute Value Function

Domain: $(-\infty, \infty)$

Range: $[0, \infty)$

Increasing: $(0, \infty)$

Decreasing: $(-\infty, 0)$



$y = x$

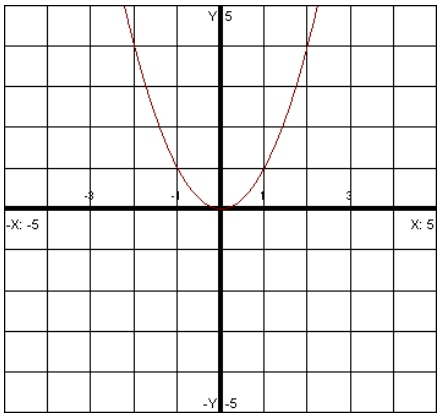
Identity Function

Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

Increasing: $(-\infty, \infty)$

Decreasing: None



$y = x^2$

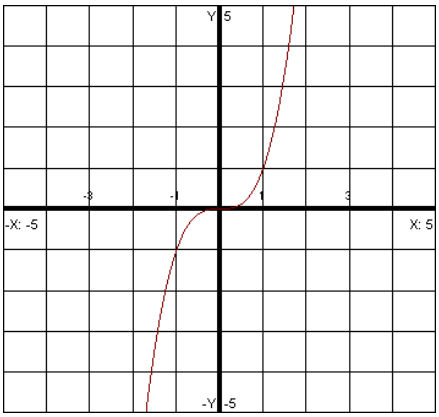
Standard Quadratic Function

Domain: $(-\infty, \infty)$

Range: $[0, \infty)$

Increasing: $(0, \infty)$

Decreasing: $(-\infty, 0)$



$y = x^3$

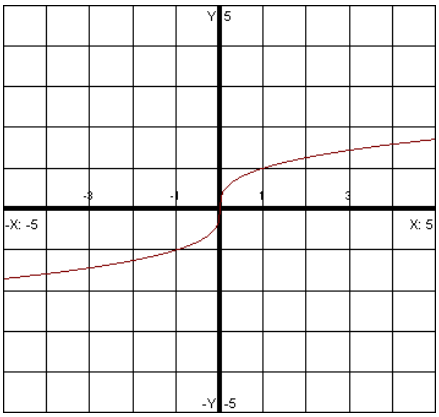
Standard Cube Function

Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

Increasing: $(-\infty, \infty)$

Decreasing: None



$y = \sqrt[3]{x}$

Cube Root Function

Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

Increasing: $(-\infty, \infty)$

Decreasing: None

Piecewise Functions

These functions are made up of different pieces. Each piece is defined for certain values of x.

EXAMPLE: Use the function $f(x)=\begin{cases} x+2 & \text{if } x<-3 \\ x-2 & \text{if } x\geq -3 \end{cases}$ to find $f(-4)$, $f(-3)$ and $f\left(-\frac{3}{2}\right)$. Then graph. and use this to determine the graph's range.

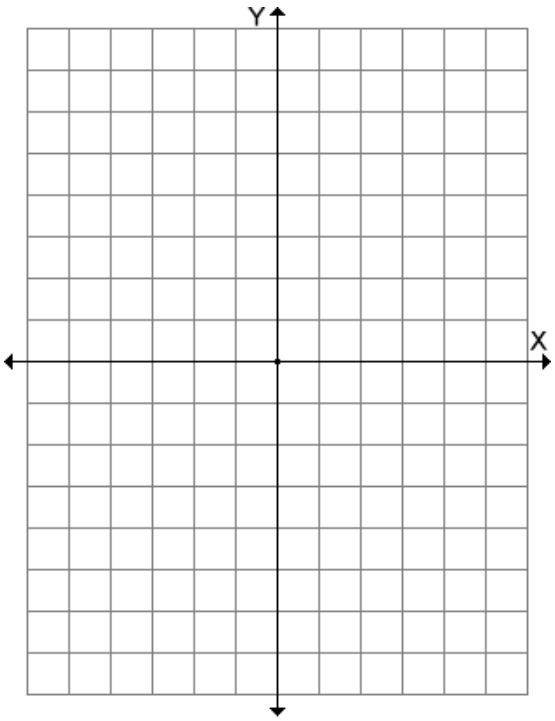
a.) $f(-4)$

b.) $f(-3)$

c.) $f\left(-\frac{3}{2}\right)$

x	$y=x+2$	(x, y)
-5		
-4		
-3		

x	$y=x-2$	(x, y)
-3		
-2		
-1		



EXAMPLE: Use the function $f(x)=\begin{cases}-\frac{1}{2}x^2 & if \quad x<1\\ 2x+1 & if \quad x\geq 1\end{cases}$ to find $f(-1)$, $f(1)$ and $f\left(\sqrt{\frac{9}{10}}\right)$. Then graph. and use this to determine the graph's range.

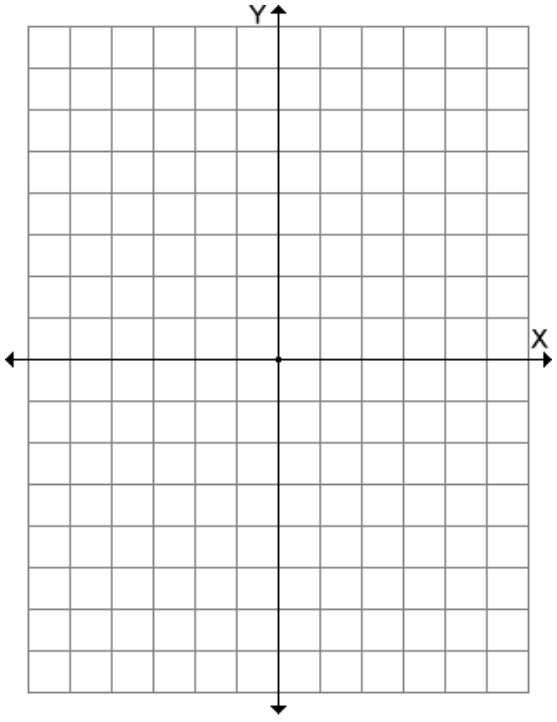
a.) $f(-1)$

b.) $f(1)$

c.) $f\left(\sqrt{\frac{9}{10}}\right)$

x	$y=-\frac{1}{2}x^2$	(x, y)
-1		
0		
1		

x	$y=2x+1$	(x, y)
1		
2		
3		



EXAMPLE: Use the function $f(x)=\begin{cases} 0 & if \quad x<-3 \\ -x & if \quad -3\le x<0 \\ x^2-1 & if \quad x\ge 0 \end{cases}$ to find $f(0)$, $f(-1)$, $f\left(\frac{\sqrt{10}}{2}\right)$, $f(-\sqrt{11})$.

a.) $f(0)$

b.) $f(-1)$

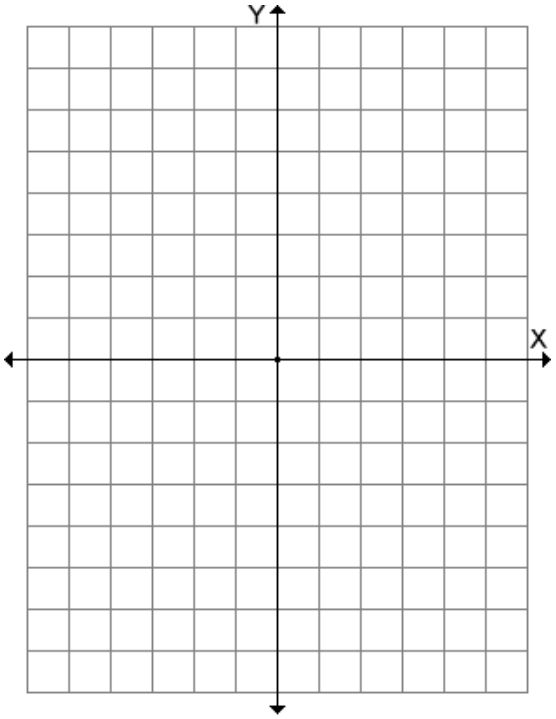
c.) $f\left(\frac{\sqrt{10}}{2}\right)$

d.) $f(-\sqrt{11})$

x	$y = 0$	(x, y)
-5		
-4		
-3		

x	$y = -x$	(x, y)
-3		
-1		
0		

x	$y = x^2 - 1$	(x, y)
0		
1		
2		



EXAMPLE: Write equations for the piecewise function whose graph is shown below: