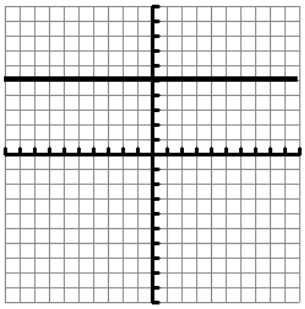
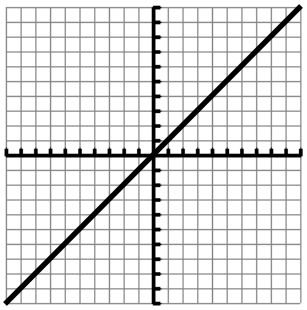
2.4 Library of functions

The functions below are the "building blocks" for many other functions. Make a sketch of the graph of these basic functions. Keep these for reference in your "memory". They'll come in handy later…

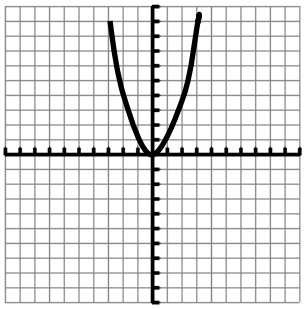
1) The Constant Function: $y = b$



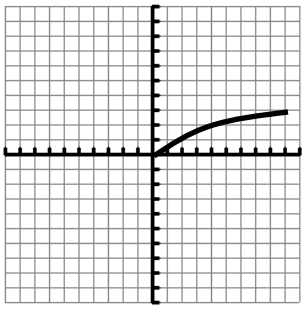
2) The Identity Function $y = x$



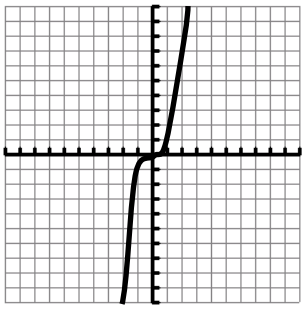
3) The Square Function: $y = x^2$



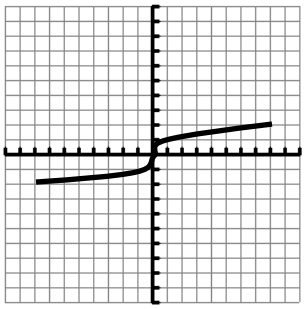
4) The Square Root function: $y = \sqrt{x}$



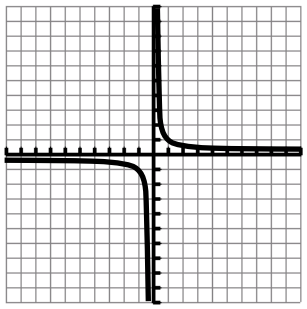
5) The Cube Function: $y = x^3$



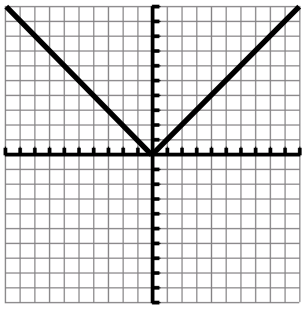
6) The Cube Root Function: $y = \sqrt[3]{x}$



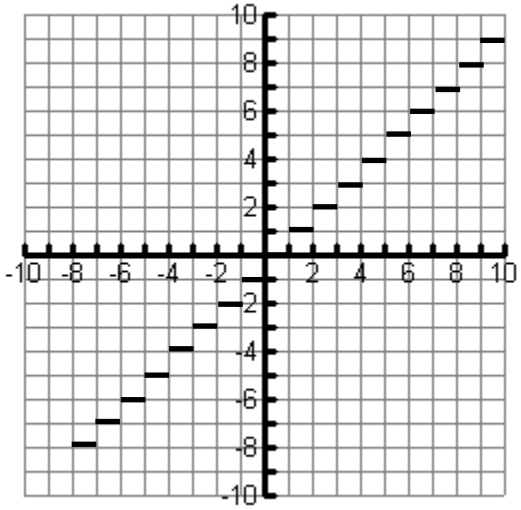
7) The Reciprocal Function: $y = \frac{1}{x}$



8) The Absolute Value Function: $y = |x|$



9) The Greatest Integer Function: y = int(x) or y = $[\![x]\!]$



Problems:

1) If $f(x) = \text{int}(x)$, what is $f(1.4)$? $f(0.9)$? $f(-2.3)$?

   1, 0 ,-3

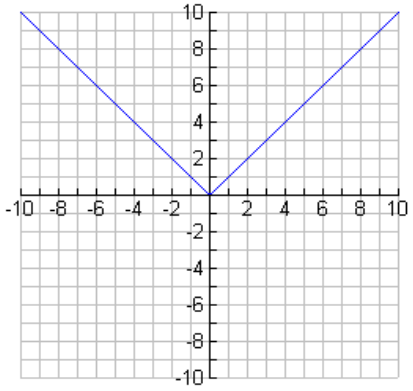
2) If $g(x) = \text{int}\left(\frac{x}{2}\right)$, what is $g(2.6)$? $g(-3.4)$?

   1, -2

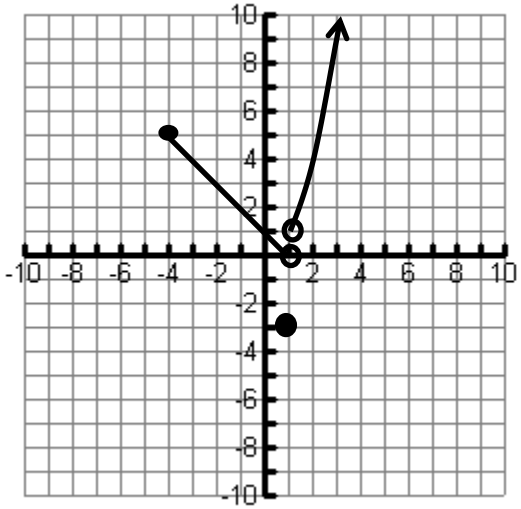
Piecewise-Defined Functions

Sometimes a function is defined differently on **different parts of its domain**. For example, the absolute value function $f(x)=|x|$ is actually defined by two equations $f(x)=x$ if $x\geq 0$ and $f(x)=-x$ if $x<0$. For convenience we generally combine these equations into one expression such as:

$$f(x)=\begin{cases} x & \text{if } x\geq 0 \\ -x & \text{if } x<0 \end{cases}$$



1) For $f(x)=\begin{cases} -x+1 & \text{if } -4\leq x<1 \\ -3 & \text{if } x=1 \\ x^2 & \text{if } x>1 \end{cases}$



A) Graph f

B) Find $f(0)$ =1

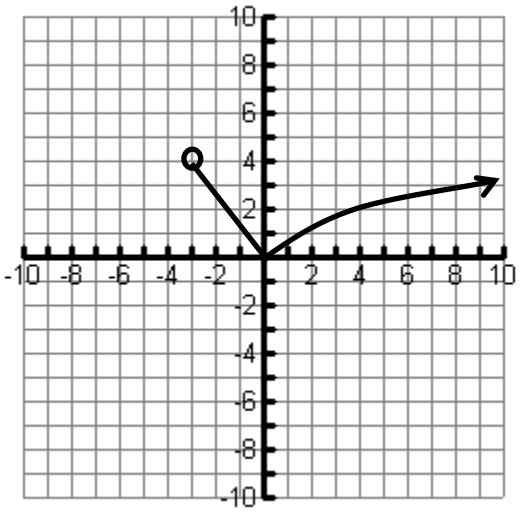
C) Find $f(1)$ =-3

D) Find $f(2)$ =4

E) Determine the domain and range Domain=[-4,+∞) {x|-4<=x}

Range=$[-3]\cup(0,+\infty)$ {y|y=-3,y>0}

2) For $f(x)=\begin{cases} -\frac{4}{3}x & \text{if } -3<x\le 0 \\ \sqrt{x} & \text{if } x>0 \end{cases}$



A) Graph f

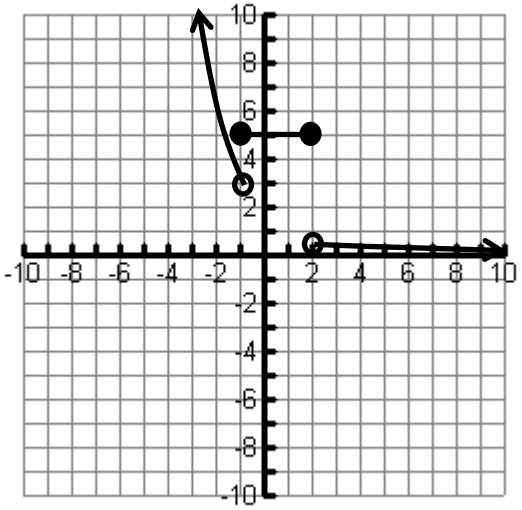
B) $f(-3)$=Undefined

C) $f(0)$=0

D) $f(16)$=4

E) What is the domain and range
in interval notation? Domain: (-3,+∞) {x|-3<x<+∞} Range: [0,+ ∞) {y|y>=0}

3) For $f(x)=\begin{cases} x^2+2, & x<-1 \\ 5, & -1\le x\le 2 \\ \frac{1}{x}, & x>2 \end{cases}$



a) Graph

b) f(0)= 5

c) f(-3)=11

d) f(5)=.2

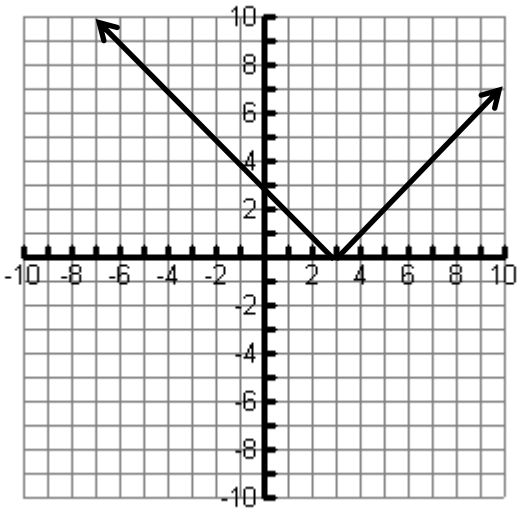
e) For what value of x is f(x)=3? f(x)=0.25?
F(x)=3, no solution. f(x)=.25 when x =4

f) Domain is __All reals_____ Range is: __(0,.5)∪(3,+∞)___

4) Find a piecewise function to define $f(x) = |x - 3|$ without using absolute value.

F(x) = { -x+3 -∞<x<3 ; x-3 3<=x<∞

A) Graph f



B) $f(0) =$ 3

C) $f(-200) = 203$

D) What is the domain and range in interval notation?

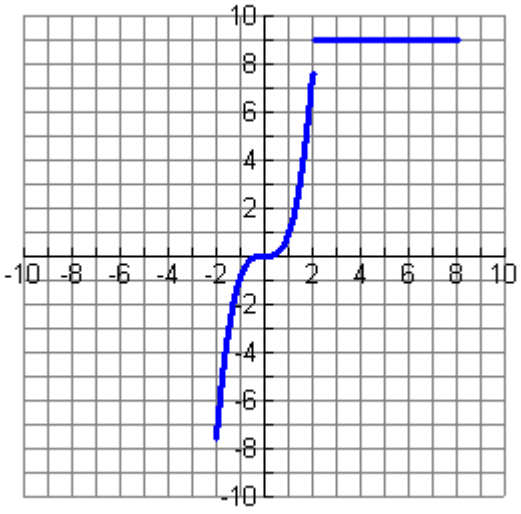
Range:[0,+∞)

Domain: All reals

5) A piecewise function is given in the graph below. Assume that all pieces are members of the library of functions.

a) Define f.

b) Give its domain and range.



F(x)=

{ X^3 -2<=x<2 ; 9 2<=x<=8