

**Library of Functions:**

Square Function:  $f(x) = x^2$

Square Root Function:  $f(x) = \sqrt{x} = x^{\frac{1}{2}}$

Cube Function:  $f(x) = x^3$

Cube Root Function:  $f(x) = \sqrt[3]{x} = x^{\frac{1}{3}}$

Power Function:  $f(x) = x^n, n \neq 0$

Root Function:  $f(x) = \sqrt[n]{x} = x^{\frac{1}{n}}, n \geq 2$

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

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

*29 Graph  
20 Graph!*

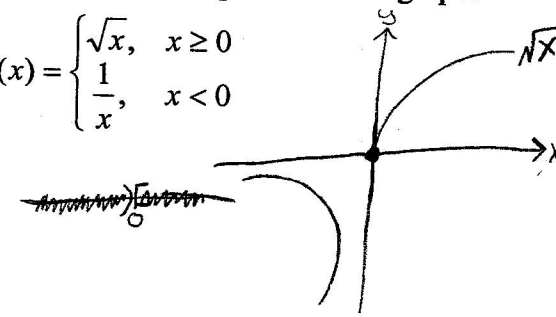
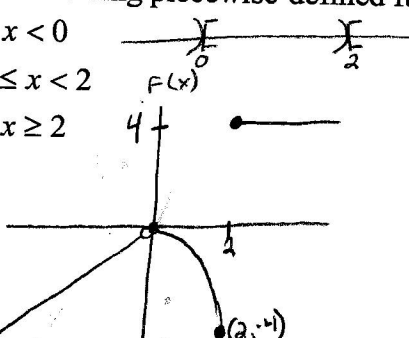
When functions are defined by more than one equation, they are called **piecewise-defined functions**.

1. Sketch the graph of the following piecewise-defined functions. Label at least three points on the graph.

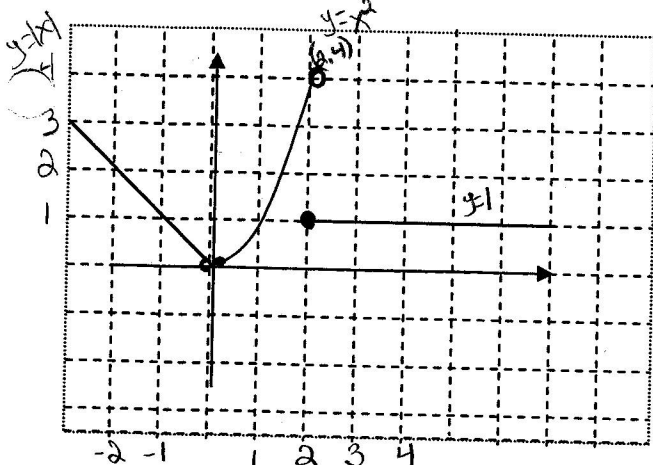
a)  $f(x) = \begin{cases} x, & x < 0 \\ -x^2, & 0 \leq x < 2 \\ 4, & x \geq 2 \end{cases}$

b)  $f(x) = \begin{cases} \sqrt{x}, & x \geq 0 \\ \frac{1}{x}, & x < 0 \end{cases}$

*flip over  
for better  
graph*



2. Give the piecewise-defined function for the following graph?



$f(x) = \begin{cases} -x, & x < 0 \\ x^2, & 0 \leq x < 2 \\ 1, & x \geq 2 \end{cases}$

3. The function  $f$  is defined as

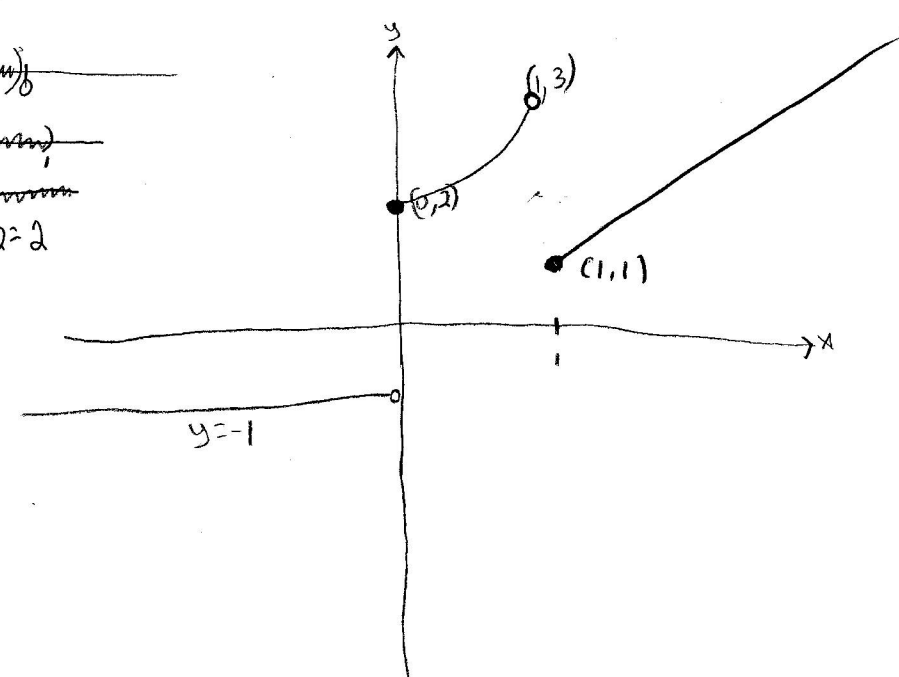
$f(x) = \begin{cases} -1, & x < 0 \\ x^2 + 2, & 0 \leq x < 1 \\ |x|, & x \geq 1 \end{cases}$

- (a) Find  $f(0)$ ,  $f(-2)$ , and  $f(3)$ .  
 $f(0) = 0^2 + 2 = 2$   
 $f(-2) = -1$   
 $f(3) = |3| = 3$

(b) Determine the domain of  $f$ .

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

(c) Graph  $f$ .



(d) Use the graph to find the range of  $f$ .

$R: \{y \mid y = -1 \text{ or } y \geq 1\}$