

In this unit, you will be learning about different transformations on functions that you have seen before in your mathematical studies over the past few years. By transforming graphs, we can use them as models to solve practical situations. You will be using model functions throughout the course in applied problems and will be expanding your repertoire of functions. However, before you do this, it is essential that you know the basic transformations and are able to build on your present knowledge of some basic functions.

## 1.4 Some Functions and Their Graphs

### Functions and Graphs you should know:

#### 1. Constant functions:

Simplest constant function is  $y = 1$ .

Complete the table and sketch the graph described.

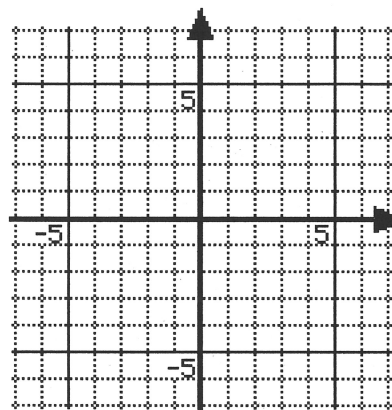
$x$	$y$
-3	
-2	
-1	
0	
1	
2	
3	

Domain:

Range:

What is the slope of this line?

What is the  $y$ -intercept?



#### 2. Linear functions:

Simplest linear function is  $y = x$ .

Complete the table and sketch the graph described.

$x$	$y$
-3	
-2	
-1	
0	
1	
2	
3	

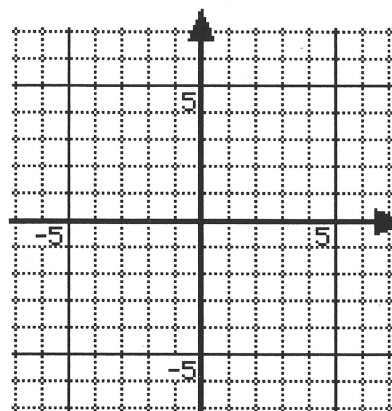
Domain:

Range:

What is the slope of this line?

What is the  $y$ -intercept?

**NOTE:** This function is sometimes called the identity function. Why?



### 3. Quadratic Functions:

Simplest quadratic function is  $y = x^2$ .

Complete the table and sketch the graph described.

$x$	$y$
-3	
-2	
-1	
0	
1	
2	
3	

Domain:                      Range:  
What is the vertex of this parabola?  
What type of symmetry does this graph have?  
What is the equation of the axis of symmetry?

### 4. Cubic functions:

Simplest cubic function is  $y = x^3$ .

Complete the table and sketch the graph described.

$x$	$y$
-3	
-2	
-1	
0	
1	
2	
3	

Domain:                      Range:  
What type of symmetry does this graph have?

#### NOTE:

A function that satisfies the condition  $f(-x) = f(x)$  is called an **even function**.

An even function is symmetric about the  $y$ -axis.

A function that satisfies the condition  $f(-x) = -f(x)$  is called an **odd function**.

An odd function is symmetric about the origin.

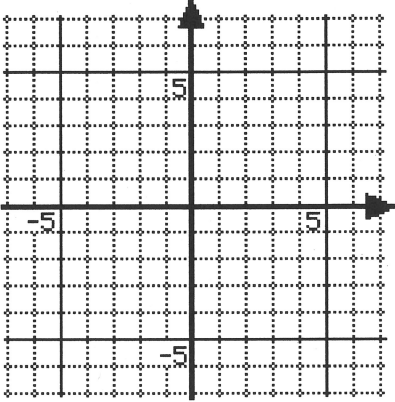
Classify the functions above as either even or odd.

### 5. Reciprocal functions:

Simplest reciprocal function is  $y = \frac{1}{x}$ .

Complete the table and sketch the graph described.

$x$	$y$
-2	
-1	
-0.5	
0	
0.5	
1	
2	



Domain: \_\_\_\_\_ Range: \_\_\_\_\_

This graph is a hyperbola whose asymptotes are the  $x$ - and  $y$ -axes.

What type of symmetry does this graph have?

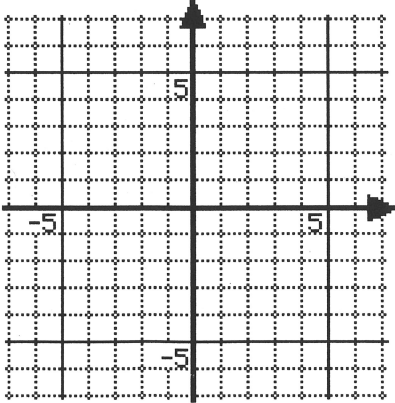
Is it an even or odd function?

### 6. Square Root functions:

Simplest square root function is  $y = \sqrt{x}$ .

Complete the table and sketch the graph described.

$x$	$y$
0	
1	
4	
9	



Domain: \_\_\_\_\_ Range: \_\_\_\_\_

This graph is half of the parabola:  $x = y^2$ .

What would be the equation of the bottom half of this parabola?

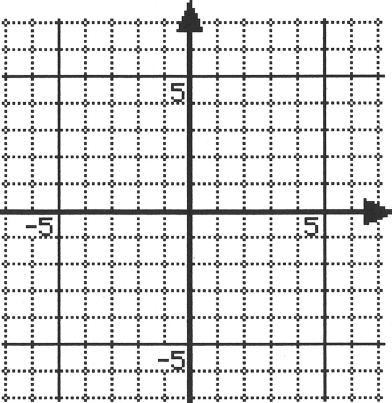
### 7. Absolute Value functions:

Simplest absolute value function is  $y = |x|$ .

Complete the table and sketch the graph described.

$x$	$y$
-3	
-2	
-1	
0	
1	
2	
3	

Domain:                      Range:



### 8. Semicircular functions:

A simple semicircular function is  $y = \sqrt{25 - x^2}$ .

Complete the table and sketch the graph described.

$x$	$y$
-5	
-4	
-3	
0	
3	
4	
5	

Domain:                      Range:

This graph is half of the circle:  $x^2 + y^2 = 25$  with a centre  $(0, 0)$  and radius 5.

What would be the equation of the bottom half of this circle?

What would be the equation of a semicircular function that the top half of a circle with radius 9 and centre  $(0, 0)$ ?

