

Name: \_\_\_\_\_

Period: \_\_\_\_\_

## How to Straighten Graphs

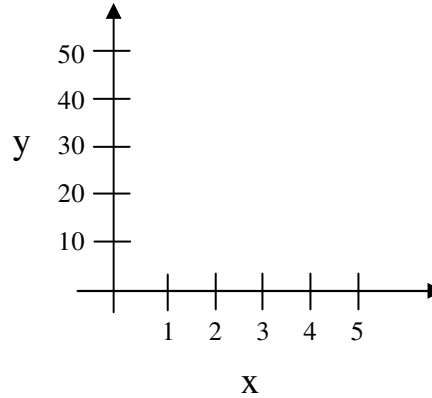
This worksheet will teach you how to recognize and straighten functions on graphs. This concept is not intuitive and may require that you work this worksheet more than once to feel comfortable with the procedure.

### 1) Function: $y = x^2$ .

A) The y-data in the table below is based on a  $x^2$  function.

x	y
1	2
2	8
3	18
4	32
5	50

B) Graph the given data below.

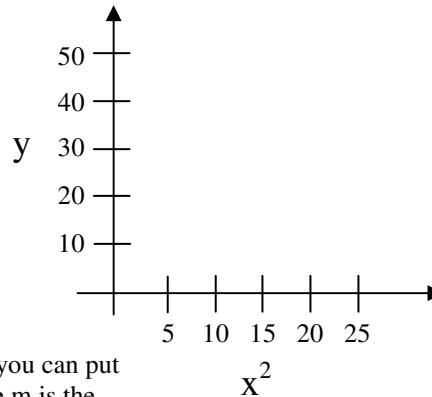


*The graph should be the right side of a parabola: the right side of a "U".*

C) Fill in the following table, by squaring the above x-values. Notice that the y-values are the same as above.

$x^2$	y
	2
	8
	18
	32
	50

D) Graph the data below. Notice that the y-axis has not changed, but that the x-axis is now  $x^2$ .



*Your graph should now be straight.*

*Now, you can find the slope of the graph.*

Why do we care about a straight line anyway? Because you can put it into the form of the linear equation:  $y = mx + b$ , where  $m$  is the slope and  $b$  is the y-intercept. Again, why? Because equations are derived from experimental data that is graphed, straightened, and the slope, calculated. You can't find the slope of a curved line.

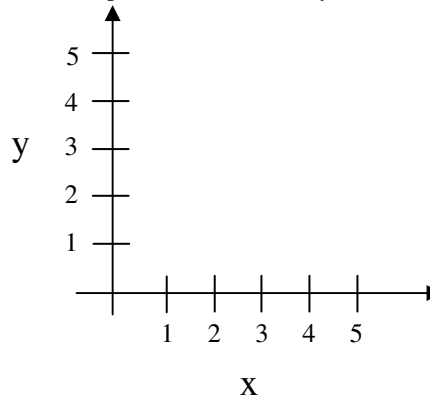
This second graph above (1D) is an  $x^2$  function with a slope of 2:  $y = 2x^2$ . If you look at the original data, you will see this is how the y-values were calculated.

### 2) Function: $y = 1/x$

A) In the table below the y-values are based on a  $1/x$  function.

x	y
1	4
2	2
3	1.3
4	1
5	0.8

B) Graph the table below (y vs. x).



*The graph should have the shape of a curved L.*

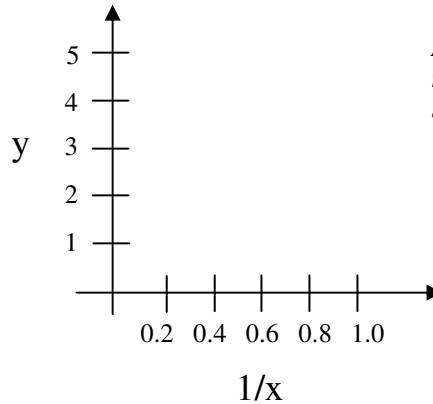
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- C) Fill in the following table:  
Remember to find  $1/x$  using the  $x$ -values from the previous table. Use the same  $y$ -values as before.

$1/x$	$y$
	4
	2
	1.3
	1
	0.8

- D) Graph the table below. Notice, again, that the  $y$ -axis stays exactly the same.

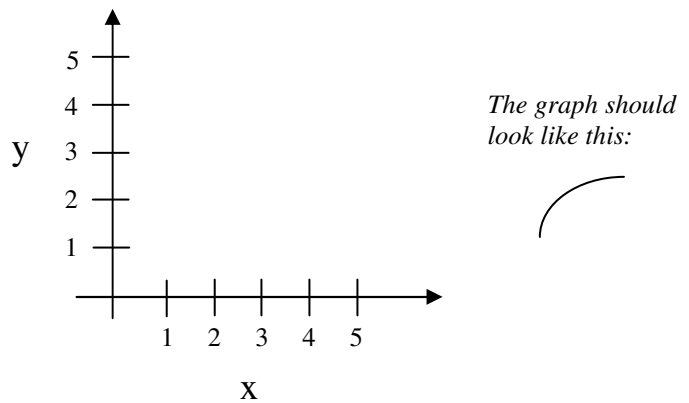


3) **Function:**  $y = \sqrt{x}$

- A) The following table shows data based on a square root function. There is one extra data point to be able to see the shape well

$x$	$y$
0.5	1.4
1	2
2	2.8
3	3.5
4	4
5	4.5

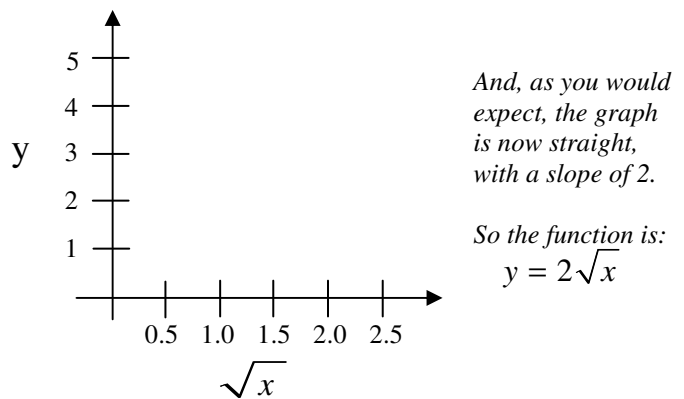
- B) Graph the data below.



- C) Just as we did previously, the  $y$ -values will not change. Fill in left column by taking the square roots of each of the  $x$ -values in the table above.

$\sqrt{x}$	$y$
	1.4
	2
	2.8
	3.5
	4
	4.5

- D) And, for the last time, graph the data below.



In all of the above examples if you graph  $y$  vs.  $x$ , the graphs have different shapes, but when you graph  $y$  vs. the function ( $x^2$ ,  $1/x$ , etc.) the graphs become straight. Even though these were easy examples, with simple slopes, the procedure is exactly the same with real-world data: graph the data; determine the function from the shape; do not change the  $y$ -values or the  $y$ -axis intervals; do the function to the  $x$ -data; graph  $y$  vs. the function; calculate the slope. Of course, this procedure depends on you being able to recognize these basic shapes, so you should memorize them.