

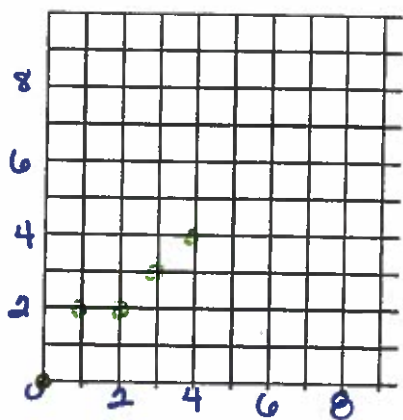
90 Lesson 4-2 and 4-3 Patterns and Functions (Linear and Non-Linear)

In a relationship between variables, the dependent variable changes in response to another variable, the independent variable. Values of the independent variable are called inputs (x) (the domain). Values of the dependent variable are called output (y) (the range).

A linear function is a function whose graph is a nonvertical line or part of a nonvertical line.

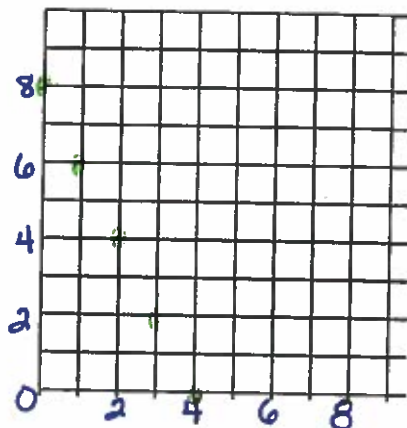
Graph each set of ordered pairs. Use word to describe the pattern shown in the graph.

- A. $\{(0,0), (1, 2), (2,2), (3, 3), (4, 4)\}$



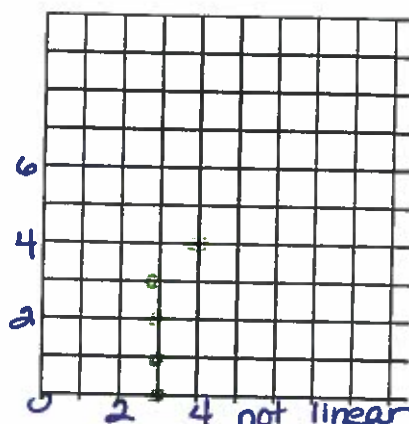
non-linear function

- B. $\{(0,8), (1, 6), (2,4), (3, 2), (4, 0)\}$



linear function
(discrete)

- C. $\{(3,0), (3, 1), (3,2), (3, 3), (4, 4)\}$



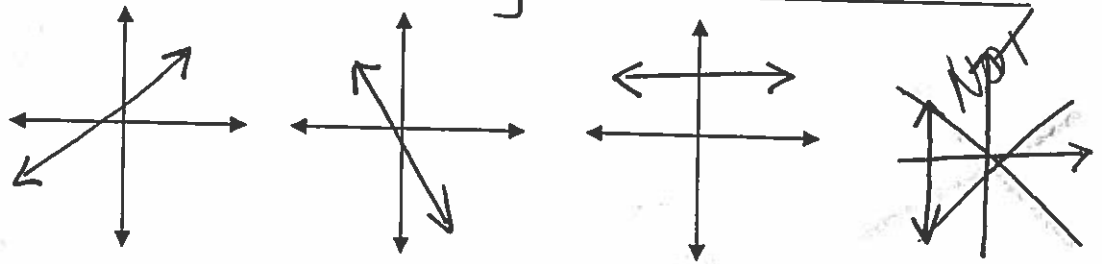
not linear
not a function

- D. Using the diagram below, complete the table showing the relationship between the number of squares and the perimeter of the figure they form. Is this a function? Is it linear?

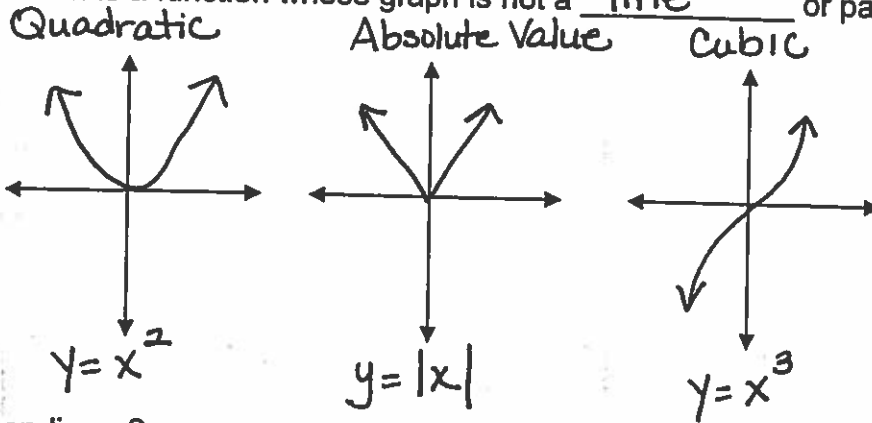


Number of Squares	Perimeter
1	4
2	6
3	8
4	10
10	22
30	62
n	$2n + 2$

Linear Function Graph makes a straight line.



Non-linear Function is a function whose graph is not a line or part of a line.



Is it linear or non-linear?

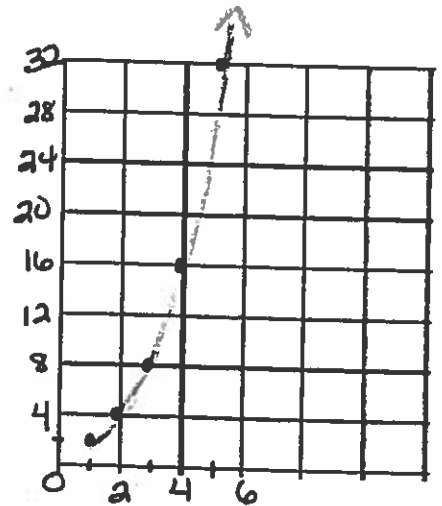
linear

1	2.54
2	5.08
3	7.62
4	10.16
6	15.24

$$y = 2.54x$$

Level, x	Number of Calls, y	Ordered Pair (x, y)
1	2	(1, 2)
2	4	(2, 4)
3	8	(3, 8)
4	16	(4, 16)
5	32	(5, 32)

$$y = 2^x$$



exponential function

G The ordered pairs (1, 1), (2, 8), (3, 27), (4, 64), and (5, 125) represent a function. What is a rule that represents this function?

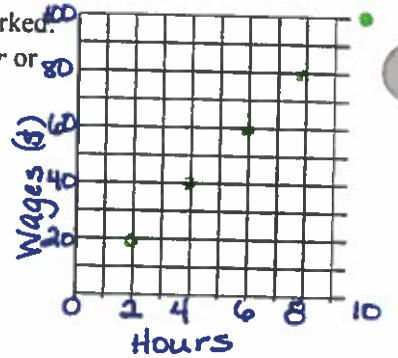
$$y = x^3$$

1. A worker's wages W , in dollars, is a function of the number h of hours worked. Graph the function shown by the table. Tell whether the function is *linear* or *nonlinear*.

ind.
dep.

Hours, h	2	4	6	8	10
Wages (\$), W	20	40	60	80	100

linear function
 $W = 10h$

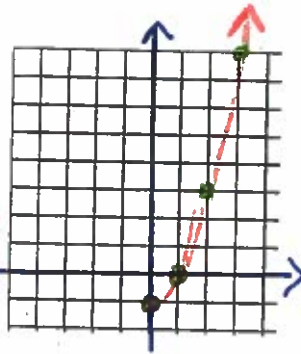


Graph the function shown by each table. Tell whether the function is *linear* or *nonlinear*.

2.

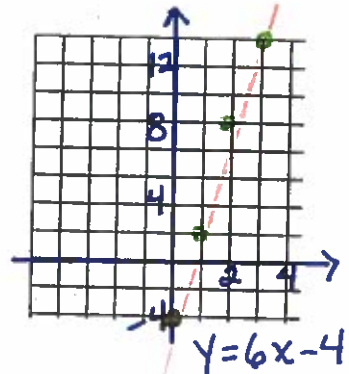
x	y
0	-1
1	0
2	3
3	8

$y = x^2 - 1$



3.

x	y
0	-4
1	2
2	8
3	14



Each set of ordered pairs represents a function. Write a rule that represents the function.

4. $(0, 0), (1, 1), (2, 4), (3, 9), (4, 16)$

$y = x^2$

5. $(0, 1), (1, 5), (2, 9), (3, 13), (4, 17)$

$y = 4x + 1$

6. $(0, -1), (1, 0), (2, 7), (3, 26), (4, 63)$

$y = x^3 - 1$

7. $(0, 2), (1, 1), (2, 0), (3, -1), (4, -2)$

$y = -x + 2$
OR
 $y = 2 - x$

x	y
0	1
1	5
2	9
3	13
4	17

x	y
0	2
1	1
2	0
3	-1
4	-2

8. **Writing** How can you determine if a function is linear or nonlinear from the graph of the function?

If the graph is a non-vertical line, it is a function.

9. **Error Analysis** A student says that the function shown by the table below can be represented by the rule $y = x^2 - 1$. Describe and correct the error.

x	0	1	2	3	4
y	-1	1	3	5	7

+2 +2 +2

It's linear, so NO exponent.

$y = 2x - 1$