

LINEAR/QUADRATIC/EXPONENTIAL TABLES

HOW TO RECOGNIZE THE TYPE OF GRAPH FROM A TABLE

To recognize if a function is linear, quadratic (a parabola), or exponential without an equation or graph, look at the differences of the y -values between successive integral x -values. If the difference is constant, the graph is linear. If the difference is not constant but the second set of differences are constant, the graph is quadratic. If the differences follow a pattern similar to the y -values, the graph is exponential. See the examples below for clarity.

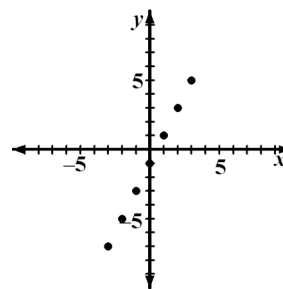
Examples

Based on each table, identify the shape of the graph.

Example 1

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

2 2 2 2 2 2

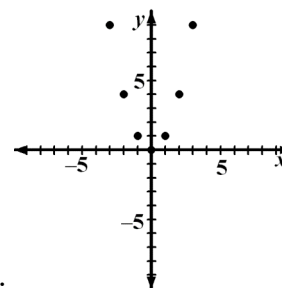


The difference in y -values is always two, a constant. The graph is linear and is verified at right.

Example 2

x	-3	-2	-1	0	1	2	3
y	9	4	1	0	1	4	9

-5 -3 -1 1 3 5
2 2 2 2 2

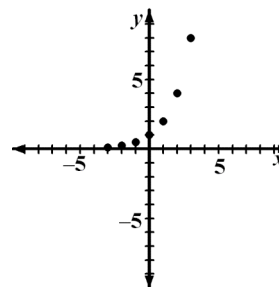


The first difference in y -values is not constant but the second difference is. The graph is quadratic and is verified at right.

Example 3

x	-3	-2	-1	0	1	2	3
y	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	8

$\frac{1}{8}$ $\frac{1}{4}$ $\frac{1}{2}$ 1 2 4



The difference in y -values follows a pattern similar to the y -values. The graph is exponential and is verified at right. (In this case, the difference pattern was exactly the same as the y -values. This is not always necessary.)

Problems

Based on the difference in y-values, identify the graph as linear, quadratic, exponential, or neither.

1.

x	-3	-2	-1	0	1	2	3
y	14	10	6	2	-2	-6	-10

2.

x	-3	-2	-1	0	1	2	3
y	$\frac{1}{2}$	1	2	4	8	16	32

3.

x	-3	-2	-1	0	1	2	3
y	21	12	5	0	-3	-4	-3

4.

x	-3	-2	-1	0	1	2	3
y	-16	-13	-10	-7	-4	-1	2

5.

x	-3	-2	-1	0	1	2	3
y	-14	-9	-4	1	6	11	16

6.

x	-3	-2	-1	0	1	2	3
y	-18	-6	-2	0	2	6	18

7.

x	-3	-2	-1	0	1	2	3
y	4	8	16	32	64	128	256

8.

x	-3	-2	-1	0	1	2	3
y	$\frac{1}{27}$	$\frac{1}{9}$	$\frac{1}{3}$	1	3	9	27

9.

x	-3	-2	-1	0	1	2	3
y	30	20	12	6	2	0	0

10.

x	-3	-2	-1	0	1	2	3
y	11	9	7	5	3	1	-1

11.

x	-3	-2	-1	0	1	2	3
y	$\frac{1}{9}$	$\frac{1}{3}$	1	3	9	27	81

12.

x	-3	-2	-1	0	1	2	3
y	-27	-9	-3	0	3	9	27

13.

x	-3	-2	-1	0	1	2	3
y	0	5	8	9	8	5	0

14.

x	-3	-2	-1	0	1	2	3
y	3	0	-1	0	3	8	15

15.

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

16.

x	-3	-2	-1	0	1	2	3
y	$\frac{9}{8}$	$\frac{9}{4}$	$\frac{9}{2}$	9	18	36	72

Answers

- | | |
|-----------------|-----------------|
| 1. linear | 2. exponential |
| 3. quadratic | 4. linear |
| 5. linear | 6. quadratic |
| 7. exponential | 8. exponential |
| 9. quadratic | 10. linear |
| 11. exponential | 12. neither |
| 13. quadratic | 14. quadratic |
| 15. neither | 15. exponential |