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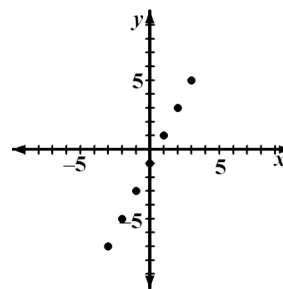
Examples
Based on each table, identify the shape of the graph.

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

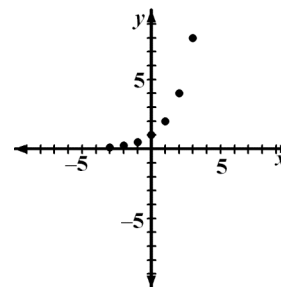| x	−3	−2	−1	0	1	2	3
y	9	4	1	0	1	4	9

−5   −3   −1   1   3   5

2   2   2   2   2
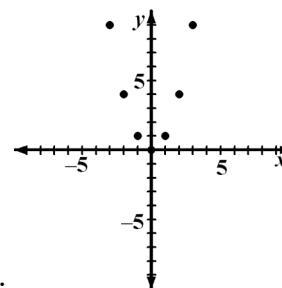
The first difference in y-values is not constant but the
second difference is. The graph is quadratic and is verified at right.

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	½	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