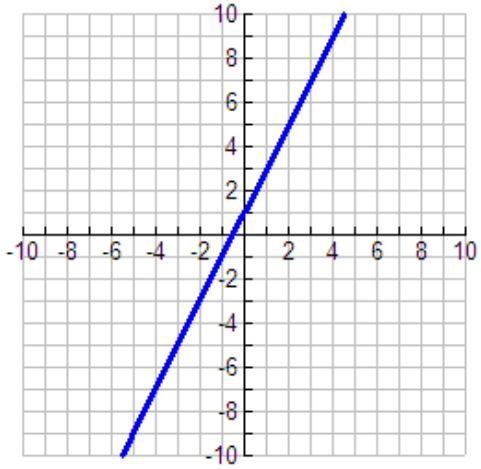
Comparing Linear, Exponential, and Quadratic Functions
Lesson 8.5

Identifying from a graph:

Linear

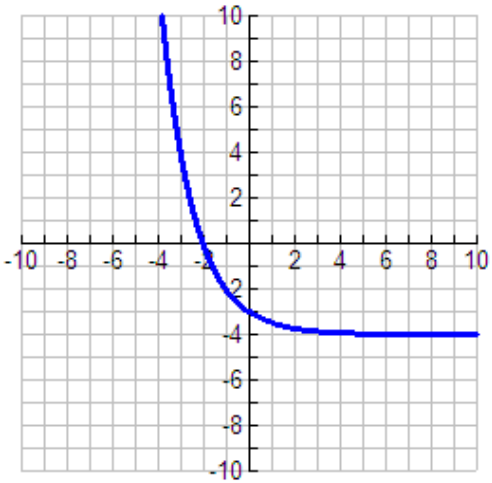
Makes a straight line



$y = mx + b$

Exponential

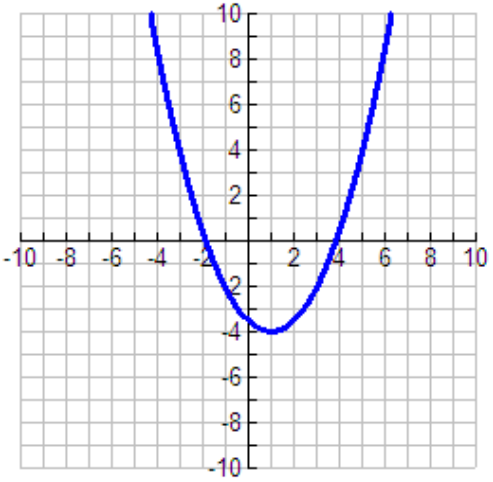
Rises or falls quickly in one direction



$y = ab^x$

Quadratic

Makes a U or ∩



$y = ax^2 + bx + c$

On Your Own

Plot the points. Tell whether the points represent a *linear*, an *exponential*, or a *quadratic* function.

1. $(-1, 5), (2, -1), (0, -1), (3, 5), (1, -3)$

   Quadratic

2. $(-1, 2), (-2, 8), (-3, 32), \left(0, \frac{1}{2}\right), \left(1, \frac{1}{8}\right)$

   Exponential

3. $(-3, 5), (0, -1), (2, -5), (-4, 7), (1, -3)$

   Linear

Key Idea

Differences and Ratios of Functions

Linear Function: $y = 2x + 5$

		+1	+1	+1	+1
x	−2	−1	0	1	2
y	1	3	5	7	9
		+2	+2	+2	+2

The y-values have a common *difference* of 2.

Exponential Function: $y = 4(2)^x$

		+1	+1	+1	+1
x	−2	−1	0	1	2
y	1	2	4	8	16
		×2	×2	×2	×2

The y-values have a common *ratio* of 2.

Quadratic Function: $y = x^2 + 2x - 1$

		+1	+1	+1	+1
x	−2	−1	0	1	2
y	−1	−2	−1	2	7
		−1	+1	+3	+5
			+2	+2	+2

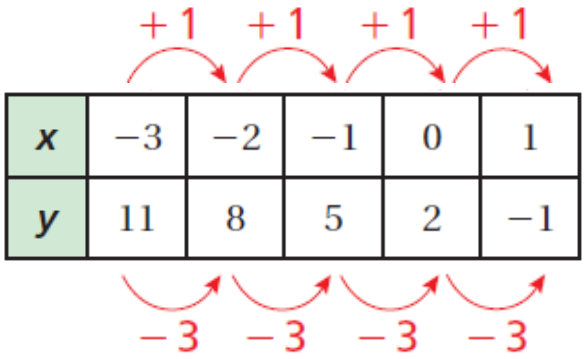
First differences

Second differences

For quadratic functions, the second differences are constant.

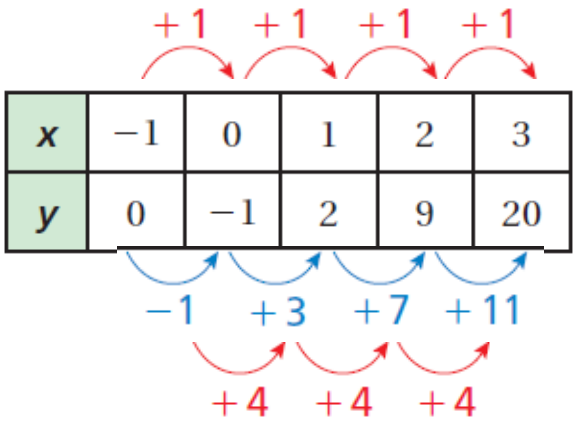
Tell whether the table of values represents a *linear*, an *exponential*, or a *quadratic* function.

a.



The y-values have a common difference of -3. So, the table represents a linear function.

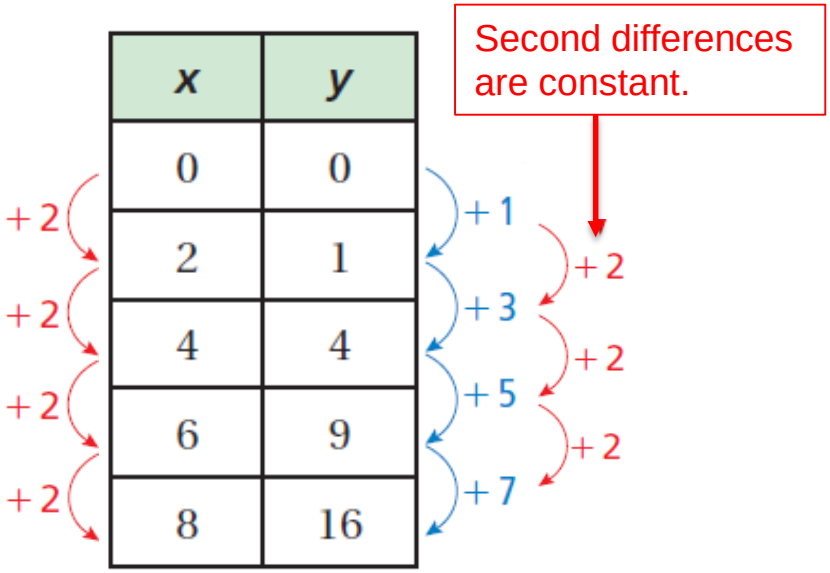
b.



The second differences are constant. So, the table represents a quadratic function.

Identifying and Writing a Function

Tell whether the table of values represents a *linear*, an *exponential*, or a *quadratic* function. Then write an equation for the function using the form $y = mx + b$, $y = ab^x$, or $y = ax^2$.



The function is quadratic.

Use the form $y = ax^2$.

$1 = a(2)^2$ Use the point (2, 1). Substitute 2 for x and 1 for y.

$\frac{1}{4} = a$ Solve for a.

So, an equation for the quadratic function is $y = \frac{1}{4}x^2$.

On Your Own

Write an equation for a function

Tell whether the table of values represents a *linear function*, an *exponential function*, or a *quadratic function*. Then write an equation for the function.

x	–2	–1	0	1	2
y	2	0.5	0	0.5	2

On Your Own

Write an equation for a function

SOLUTION

STEP 1 **Determine which type of function the table of values represents.**

x	–2	–1	0	1	2
y	2	0.5	0	0.5	2

First differences: –1.5 –0.5 0.5 1.5

Second differences: 1 1 1

$$y = \frac{1}{2}x^2$$

Homework

TB pages 439 - 441: 4-18, 33, 34