Name _____ Date _____

LESSON 9.9

Challenge Practice

For use with the lesson "Model Relationships"

You can use the idea of *finite differences* to decide whether the data can be modeled by a linear function, a quadratic function, or neither.

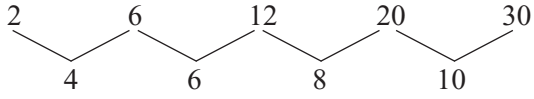
EXAMPLE 1 Find a Model for Data Given in a Table

The data in the table represent five points on the graph of a function.

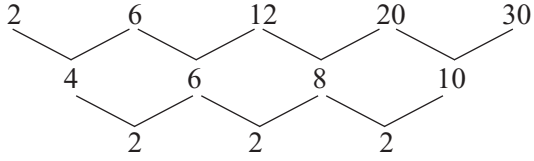
x	1	2	3	4	5
y	2	6	12	20	30

Solution

Begin by writing the y-values from the table horizontally on a piece of paper. Subtract the first y-value, 2, from the second y value, 6, and write the result (4) below and between the two y-values. Then subtract the second y-value, 6, from the third y-value, 12, and write the result (6) below and between these two y-values. Repeat the process for the remaining y-values.



The numbers 4, 6, 8, and 10 in the second row are called the *first finite differences.* If each number in this row were the same number, the points in the table would represent a linear function, but they are *not* the same. So repeat the process, this time using the first finite differences.



This numbers in the third row are called the *second finite differences*. Notice that these differences are the same. When the second finite differences are the same, the data in the table can be modeled by a quadratic function.

If the first and second differences both fail to be the same, the data in the table cannot be modeled using either a linear or quadratic function.

Determine whether the data in the table can be modeled by a *linear function*, a *quadratic function*, or *neither*.

1.

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

6

2.

x	1	2	3	4	5
y	1	−1	−3	−5	−7

3.

x	1	2	3	4	5
y	1	9	27	81	243