Study Guide and Intervention
Writing Cubic Functions

Example 1 Write a function rule.

Write a cubic function for the values in the table.

x	0	1	2	3	4	5
y	12	11.33	20.67	42	77.33	128.67

Solution

Step 1 Determine the finite differences in x-values and the third finite differences in successive y-values.

Step 2 Calculate the values for a, b, c, and d in $f(x) = ax^3 + bx^3 + cx + d$.

The value of d is the y-value when x = 0; d = 12

The third difference is equal 6a. Since 6a = 2, a = $\dfrac{1}{3}$

The second difference between the first two pairs of y-values (x = 0 and x = 1; x = 1 and x = 2) is 6a + 2b.

$$6a + 2b = 10$$
$$6\left(\dfrac{1}{3}\right) + 2b = 10$$
$$2b = 8$$
$$b = 4$$

The first difference between the y-values for x = 0 and x = 1 is equal to a + b + c

$$a + b + c = -\dfrac{2}{3}$$
$$\dfrac{1}{3} + 4 + c = -\dfrac{2}{3}$$
$$c = -\dfrac{15}{3} = -5$$

Step 3 Write the cubic function rule with the values of a, b, c, and d:

$$f(x) = \dfrac{1}{3}x^3 + 4x^3 - 5x + 12$$

Exercises

For questions 1-3, use finite differences to determine if the data sets represent linear, exponential, quadratic, or cubic function.

1.

x	$f(x)$
-1	0.2
0	1
1	5
2	25
3	125
4	625

2.

x	$f(x)$
-1	-5
0	0
1	5
2	40
3	135
4	320

3.

x	y
-1	8
0	5
1	10
2	29
3	68
4	133

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Exercises

For questions 4-6, write a cubic function for the values in the table.

4.

x	y
0	0
1	0.25
2	2
3	6.75
4	16
5	31.25

5.

x	y
0	1
1	9
2	57
3	181
4	417
5	801

6.

x	$f(x)$
0	−1
1	0.3
2	7.4
3	25.1
4	58.2
5	111.5

For questions 7 and 8, use the following information.

WEIGHT OF PACKAGE, w (POUNDS)	PRICE TO MAIL PACKAGE, p ($)
0	0
1	3.45
2	6.60
3	10.65
4	16.80
5	26.25

x	y
0	0
1	−4
2	−28
3	−76
4	−148
5	−244

7. Write a cubic function to represent the given data.

9. Does the set of data shown represent a cubic function? Justify your answer.

8. Use your cubic function to determine the cost to mail a 6-pound package.