Name _____ Date _____ Class _____

LESSON 6-9

Practice B

Curve Fitting with Polynomial Models

Use finite differences to determine the degree of the polynomial that best describes the data.

1. _____

x	*y*
0	4
1	14
2	24
3	30
4	30
5	24

2. _____

x	*y*
−2	70
−1	35
0	15
1	7
2	8
3	15

3. _____

x	*y*
2	1
1	7
0	12
−1	16
−2	19
−3	21

4. _____

x	*y*
−6	−31
−5	0
−4	16
−3	19
−2	11
−1	−6

Solve.

5. The data set shows the average price for a luxury commodity for the years since 1998.

Year	1998	1999	2000	2001	2002	2003	2004	2005
Price ($)	1000	2027	4472	7507	10,472	12,875	14,392	14,867

a. Write a polynomial function for the data.

_____

b. Predict the price of the item in 2008.

_____

Practice A

LESSON 6-9 *Curve Fitting with Polynomial Models*

Complete each statement.

1. Linear functions have constant First differences.
2. Cubic functions have constant Third differences.
3. Quadratic functions have constant Second differences.
4. Quadratic functions are Second degree functions.
5. Linear functions are First degree functions.
6. Cubic functions are Third degree functions.

Use finite differences to determine the degree of the polynomial that best describes the data.

7.

x	0	1	2	3	4	5
y	−5	1	12	29	53	85

a. Which differences are constant? Third

b. Identify the degree of the polynomial of best fit. Cubic

8.

x	−2	−1	0	1	2	3
y	32	22	15	15	24	42

a. Which differences are constant? Fourth

b. Identify the degree of the polynomial of best fit. Quartic

9.

x	5	7	9	11	13	15
y	26	40	45	44	40	36

a. Which differences are constant? Third

b. Identify the degree of the polynomial of best fit. Cubic

10. Use a graphing calculator to find a polynomial function for the data in Exercise 7.

$f(x) \approx 0.167x^3 + 2x^2 + 3.833x - 5$

11. Use a graphing calculator to find a polynomial function for the data in Exercise 9.

$f(x) \approx 0.625x^3 - 2.438x^2 + 29.438x - 68.063$

Practice B

LESSON 6-9 *Curve Fitting with Polynomial Models*

Use finite differences to determine the degree of the polynomial that best describes the data.

1. Quartic

x	y
0	4
1	14
2	24
3	30
4	30
5	24

2. Cubic

x	y
−2	70
−1	35
0	15
1	7
2	8
3	15

3. Quadratic

x	y
2	1
1	7
0	12
−1	16
−2	19
−3	21

4. Cubic

x	y
−6	−31
−5	0
−4	16
−3	19
−2	11
−1	−6

Solve.

5. The data set shows the average price for a luxury commodity for the years since 1998.

Year	1998	1999	2000	2001	2002	2003	2004	2005
Price ($)	1000	2027	4472	7507	10,472	12,875	14,392	14,867

a. Write a polynomial function for the data.

$f(x) = 7y^4 - 180y^3 + 1200y^2 + 1000$

b. Predict the price of the item in 2008.

$11,000

Practice C

LESSON 6-9 *Curve Fitting with Polynomial Models*

Use finite differences to determine the degree of the polynomial that best describes the data.

1. Quartic

x	y
−3	0
−2	104
−1	164
0	186
1	178
2	150
3	114

2. Quadratic

x	y
7	28
8	15
9	−1
10	−20
11	−42
12	−67
13	−95

3. Cubic

x	y
−10	12
−7	90
−4	153
−1	211
2	274
5	352
8	455

4. Quartic

x	y
50	−100
55	−200
60	−290
65	−364
70	−420
75	−460
80	−490

Solve.

5. The data set represents the population of a rare turtle species on an island for the years since 1980.

Year	1980	1984	1988	1990	1995	2000	2001	2005
Population	1000	736	1208	1600	2650	3200	3184	2500

a. Write a polynomial function for the data.

$f(t) = -1t^3 + 35t^2 - 190t + 1000$

b. Predict when the species will become extinct. 2010

Review for Mastery

LESSON 6-9 *Curve Fitting with Polynomial Models*

To use finite differences to determine the degree of a polynomial,

- check that the x-values increase by a constant value, and
- find successive differences of the y-values until the differences are constant.

Finite Differences					
Function Type	Linear	Quadratic	Cubic	Quartic	Quintic
Degree	1	2	3	4	5
Constant Finite Differences	First	Second	Third	Fourth	Fifth

Example:

x	−3	−2	−1	0	1	2	The x-values increase by 1.
y	78	14	0	0	2	18	
First Differences	14 − 78	0 − 14	0 − 0	2 − 0	18 − 2		First differences are not constant.
	−64	−14	0	2	16		
Second Differences	−14 − (−64)	0 − (−14)	2 − 0	16 − 2			Second differences are not constant.
	50	14	2	14			
Third Differences	14 − 50	2 − 14	14 − 2				Third differences are not constant.
	−36	−12	12				
Fourth Differences	−12 − (−36)	12 − (−12)					Fourth differences are constant.
	24	24					

A fourth degree polynomial best describes the data.

Use finite differences to determine the degree of the polynomial that best describes the data.

1.

x	−2	−1	0	1	2
y	−5	2	3	4	11
First Differences	7,	1,	1,	7	
Second Differences	6,	0,	6		
Third Differences	6,	6			

2. Identify the degree of the polynomial. Cubic