Name _____ Date _____ Class _____

LESSON 9-6

Practice C

Modeling Real-World Data

Use constant differences or ratios to determine which parent function would best model the given data set.

1.

x	−0.2	0	0.2	0.4	0.6
y	2.2	1.0	0.2	−0.2	−0.2

_____

2.

x	6	12	18	24	30
y	8000	1200	180	27	4.05

_____

Write a function that models the data set.

3.

x	−7	−4	−1	2	5
y	512	64	8	1	0.125

_____

4.

x	−6	−3	0	3	6
y	7.1	4.7	2.3	−0.1	−2.5

_____

5.

x	0.75	17	45.75	87	140.75
y	2	4.5	7	9.5	12

_____

6.

x	1.3	1.35	2.9	4.95	7.5
y	0.8	1.3	1.8	2.3	2.8

_____

7.

x	0.4	0.7	1.0	1.3	1.6
y	440.11	249.11	141	79.81	45.17

_____

8.

x	−0.6	−0.2	0.2	0.6	1.0
y	0.23	0.69	0.83	0.65	0.15

_____

Solve.

9. The table shows the number of shares of stock listed at the New York Stock Exchange since 1950.

Years since 1949	1	11	21	31	41	51
Shares (in billions)	2.4	6.5	16.1	33.7	90.7	313.9

a. Write a function that models the data. _____

b. Use your model to predict the number of shares that will be listed in 2010. _____

c. Use your model to determine the year in which the number of shares of stock listed first exceeded 10 billion. _____

LESSON 9-6

Practice A

Modeling Real-World Data

Determine which parent function would best model the given data set. Choose among linear, quadratic, exponential, and square root.

1. a. Look at the table at right. Are the data for one variable evenly spaced?

Yes, the *y*-values

b. Look at the data for the other variable. Which differences, if any, are constant?

Second differences

c. Which parent function best models the data?

Square root function

x	*y*
5	1
8	2
13	3
20	4
29	5
40	6

2.

x	*y*
2	84
4	72
6	52
8	24
10	−12
12	−56

Quadratic

3.

x	*y*
8	−26
16	−2
24	22
32	46
40	70

Linear

4.

x	*y*
1	−2
2	4
3	−8
4	16
5	−32
6	64

Exponential

Write a function that models the given data.

5. Use a graphing calculator to make a scatter plot. Then use the regression feature to find the function that best represents the data.

x	−2	0	2	4	6
y	8	10	8	2	−8

$f(x) = -0.5x^2 + 10$

Solve.

6. The table shows the number of sport utility vehicles sold in the United States from 1997 to 2003. Write a function that models the data.

Years after 1996	1	2	3	4	5	6	7
SUVs (millions)	2.3	2.8	3.1	3.2	3.8	4.0	4.3

$f(x) = 0.33x + 2.06$

LESSON 9-6

Practice B

Modeling Real-World Data

Use constant differences or ratios to determine which parent function would best model the given data set.

1.

x	12	16	20	24	28
y	0.8	3.6	16.2	72.9	328.05

Exponential

2.

x	13	19	25	31	37	43
y	−1	17	35	53	71	89

Linear

3.

x	2	7	12	17	22
y	−100	−55	40	185	380

Quadratic

4.

x	0.10	0.37	0.82	1.45	2.26
y	0.3	0.6	0.9	1.2	1.5

Square root

Write a function that models the data set.

5.

x	2.2	2.6	3.0	3.4	3.8
y	0.68	4.52	9.0	14.12	19.88

$f(x) = 2x^2 - 9$

6.

x	−5	0	5	10	15	20
y	8	6	4	2	0	−2

$f(x) = -0.4x + 6$

7.

x	0.3	0.7	1.1	1.5	1.9
y	2.5	3	3.6	4.32	5.184

$f(x) = 2.18(1.577)^x$

8.

x	0.06	0.375	0.96	1.815	2.94
y	0.2	0.5	0.8	1.1	1.4

$f(x) = 0.816\sqrt{x}$

9.

x	−6	1	8	15	22
y	15	1	30.12	102.36	217.72

$f(x) = 0.44x^2 + 0.2x + 0.36$

10.

x	0.32	2.07	4.8	8.51	13.2
y	0.9	1.6	2.3	3.0	3.7

$f(x) = 1.318x^{0.378}$

Solve.

11. The table shows the population growth of a small town.

Years after 1974	1	6	11	16	21	26	31
Population	662	740	825	908	1003	1095	1200

a. Write a function that models the data. $f(x) = 657.3(1.02)^x$

b. Use your model to predict the population in 2020. 1634 people

LESSON 9-6

Practice C

Modeling Real-World Data

Use constant differences or ratios to determine which parent function would best model the given data set.

1.

x	−0.2	0	0.2	0.4	0.6
y	2.2	1.0	0.2	−0.2	−0.2

Quadratic

2.

x	6	12	18	24	30
y	8000	1200	180	27	4.05

Exponential

Write a function that models the data set.

3.

x	−7	−4	−1	2	5
y	512	64	8	1	0.125

$f(x) = 4(0.5)^x$

4.

x	−6	−3	0	3	6
y	7.1	4.7	2.3	−0.1	−2.5

$f(x) = -0.8x + 2.3$

5.

x	0.75	17	45.75	87	140.75
y	2	4.5	7	9.5	12

$f(x) = 2.045x^{0.336}$

6.

x	1.3	1.35	2.9	4.95	7.5
y	0.8	1.3	1.8	2.3	2.8

$f(x) = 0.88x^{0.597}$

7.

x	0.4	0.7	1.0	1.3	1.6
y	4	249.11	141	79.81	45.17

$f(x) = 940(0.15)^x$

8.

x	−0.6	−0.2	0.2	0.6	1.0
y	0.23	0.69	0.83	0.65	0.15

$f(x) = -x^2 + 0.35x + 0.8$

Solve.

9. The table shows the number of shares of stock listed at the New York Stock Exchange since 1950.

Years since 1949	1	11	21	31	41	51
Shares (in billions)	2.4	6.5	16.1	33.7	90.7	313.9

a. Write a function that models the data. $f(x) = 2.15(1.1)^x$

b. Use your model to predict the number of shares that will be listed in 2010. 720 billion shares

c. Use your model to determine the year in which the number of shares of stock listed first exceeded 10 billion. 1966

LESSON 9-6

Reteach

Modeling Real-World Data

A pattern in data can suggest a model to fit the data.

If *x*-values are evenly spaced and first differences of *y*-values are constant, a **linear model** fits the data.

x	1	2	3	4	5
y	12	27	42	57	72

First differences: 15 15 15 15

Linear model: first differences are constant.

If *x*-values are evenly spaced and second differences of *y*-values are constant, a **quadratic model** fits the data.

x	4	5	6	7	8
y	9	15	23	33	45

First differences: 6 8 10 12
Second differences: 2 2 2

If first differences are not constant, try second differences.

If *x*-values are evenly spaced and ratios of *y*-values are constant, an **exponential model** fits the data.

x	10	11	12	13
y	40	100	250	625

First differences: 60 150 375
Second differences: 90 225
Ratios: $\frac{100}{40} = 2.5$ $\frac{250}{100} = 2.5$ $\frac{625}{250} = 2.5$

If first and second differences are not constant, try ratios of *y*-values.

If *y*-values are evenly spaced and second differences of *x*-values are constant, a **square root model** fits the data.

x	42	45	52	63	78
y	3	4	5	6	7

First differences: 3 7 11 15
Second differences: 4 4 4

For evenly spaced *y*-values, try first differences of *x*-values.

Determine which parent function would best model the data.

1.

x	3	4	5	6	7
y	22.3	26.6	30.9	35.2	39.5

Linear model

2.

x	32	41	56	77	104
y	1	2	3	4	5

Square root model