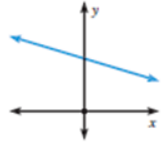
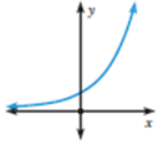
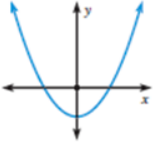


10.8 Notes- Compare Linear, Exponential, and Quadratic Models

So far you have studied linear functions, exponential functions, and quadratic functions. You can use these functions to model data.

KEY CONCEPT *For Your Notebook*

Linear, Exponential, and Quadratic Functions

<p>Linear Function $y = mx + b$</p> 	<p>Exponential Function $y = ab^x$</p> 	<p>Quadratic Function $y = ax^2 + bx + c$</p> 
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DIFFERENCES AND RATIOS A table of values represents a linear function if the *differences* of successive y-values are all equal. A table of values represents an exponential function if the *ratios* of successive y-values are all equal. In both cases, the increments between successive x-values need to be equal.

Linear function: $y = 3x + 5$

x	-1	0	1	2
y	2	5	8	11

Differences: 5 → +3 +3 +3

Exponential function: $y = 0.5(2)^x$

x	-1	0	1	2
y	0.25	0.5	1	2

Ratios: $\frac{0.5}{0.25} = 2$ x2 x2 x2

You can use differences to tell whether a table of values represents a quadratic function, as shown.

Quadratic function: $y = x^2 - 2x + 2$

x	-1	0	1	2	3
y	5	2	1	2	5

First differences: -3 -1 +1 +3

Second differences: 2 2 2

First find the differences of successive y-values, or *first differences*.

Then find the differences of successive first differences, or *second differences*.

The table of values represents a quadratic function if the second differences are all equal.

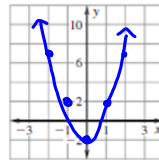
Example 1 Choose functions using sets of ordered pairs

Use a graph to tell whether the ordered pairs represent a linear function, an exponential function, or a quadratic function.

- a. (-2, 7), (-1, 1), (0, -1), (1, 1), (2, 7) ←
- b. (-2, 4), (-1, 2), (0, 1), (1, 1/2), (2, 1/4) ←
- c. (-2, 5), (-1, 3), (0, 1), (1, -1), (2, -3) ←

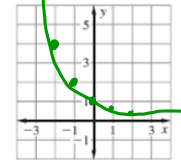
Solution

a.



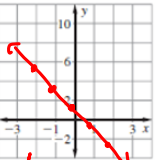
Quadratic function

b.



Exponential function

c.



Linear function

EXAMPLE 2 Identify functions using differences or ratios

Use differences or ratios to tell whether the table of values represents a linear function, an exponential function, or a quadratic function.

a.

x	-2	-1	0	1	2
y	-6	-6	-4	0	6

+0 +2 +4 +6

2 2 2

Quadratic Function

b.

x	-2	-1	0	1	2
y	-2	1	4	7	10

+3 +3 +3 +3

Linear Function

EXAMPLE 3 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.

a.

x	-2	-1	0	1	2
y	2	0.5	0	0.5	2

Quadratic
 $y = ax^2 + bx + c$
 $y = \frac{1}{2}x^2$

b.

x	-3	-2	-1	0	1
y	-7	-5	-3	-1	1

linear
 $y = mx + b$
 $y = 2x - 1$

EXAMPLE 3 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.

c.

x	-2	-1	0	1
y	0.08	0.4	2	10

Exponential
 $y = a(b)^x$
 $y = 2(5)^x$

d.

x	-3	-2	-1	0	1
y	6	3	2	3	6

Quadratic
 $y = x^2 + 2x + 3$

Example 4

linear
 $y = mx + b$
 $y = 1.85x + 3$

The table shows the cost to run an ad in a magazine. Tell whether the data can be modeled by a *linear function*, an *exponential function*, or a *quadratic function*. Then write an equation for the function.

Number of lines, x	Total cost, y
4	\$10.40
5	\$12.25
6	\$14.10
7	\$15.95
8	\$17.80
9	\$19.65

Homework

10.8 Pracce B Worksheet

ADD: #7, 8, 9 also write an equaon for each funcon