Algebra 1

Lesson 10.8

Compare Linear, Exponential, and Quadratic Models

Warm-Up

Solve with the quadratic formula.

$4x^2 + 3x = 1$

$-1 \quad -1$

$4x^2 + 3x - 1 = 0$

$a = 4$, $b = 3$, $c = -1$

$$x = \frac{-3 \pm \sqrt{(3)^2 - 4(4)(-1)}}{2(4)}$$

$$x = \frac{-3 \pm \sqrt{9 + 16}}{8}$$

$$x = \frac{-3 \pm 5}{8}$$

$$x = \frac{1}{4}, -1$$

Solve by completing the square.

$a^2 + 6a - 4 = 0$

$+4 \quad +4$

$a^2 + 6a = 4$

$a^2 + 6a + \boxed{9} = 4 + \boxed{9}$

$(a+3)^2 = 13$

$a + 3 = \pm\sqrt{13}$

EXACT: $a = -3 \pm \sqrt{13}$

APPROX: $a \approx 0.61, -6.61$

Solve by using square roots.

$3x^2 - 11 = 7$

$+11 \quad +11$

$\frac{3x^2}{3} = \frac{18}{3}$

$x^2 = 6$

EXACT: $x = \pm\sqrt{6}$

APPROX: $x \approx \pm 2.45$

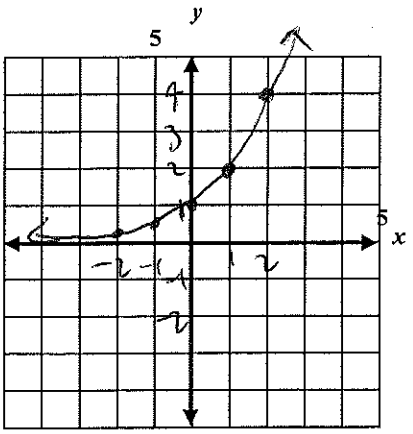
Example 1. Choosing a Function by Plotting Ordered Pairs

Use the axes given to plot the set of ordered pairs. Then tell whether the ordered pairs represent a *linear function*, an *exponential function*, or a *quadratic function*.

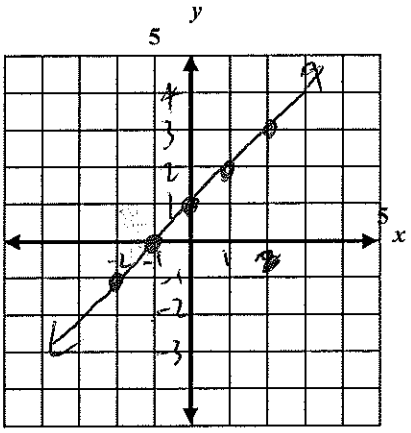
(a) $\left(-2, \frac{1}{4}\right), \left(-1, \frac{1}{2}\right), (0,1), (1,2), (2,4)$

(b) $(-2,-1), (-1,0), (0,1), (1,2), (2,3)$

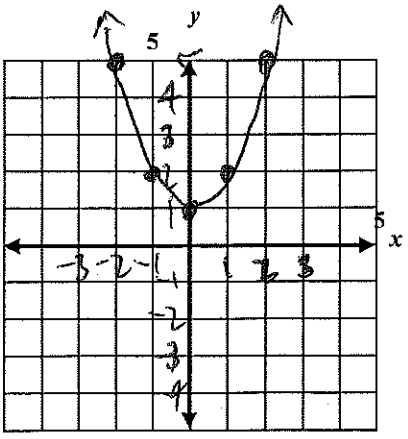
(c) $(-2,5), (-1,2), (0,1), (1,2), (2,5)$



EXPONENTIAL



LINEAR



QUADRATIC

Example 2. Choosing a Function from a Table of Values

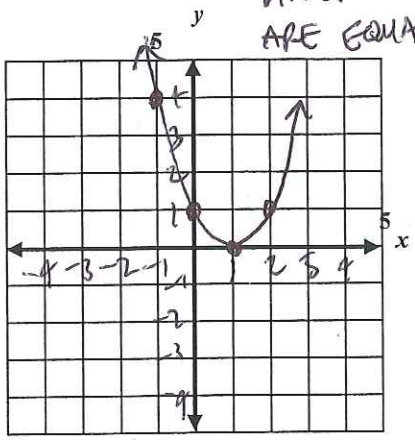
Use the table of values to plot points and determine if the table represents a *linear function*, an *exponential function*, or a *quadratic function*.

(a)

x	y
-2	9
-1	4
0	1
1	0
2	1

-5, -3, -1, +1 ; +2, +2, +2

SECOND DIFFERENCES ARE EQUAL



QUADRATIC

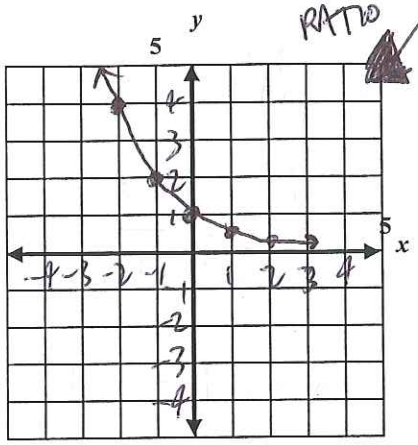
(b)

x	y
-2	4
-1	2
0	1
1	0.5
2	0.25

× 1/2, × 1/2, × 1/2, × 1/2

$y = 1\left(\frac{1}{2}\right)^x$

CONSTANT RATIO



EXPONENTIAL

(c)

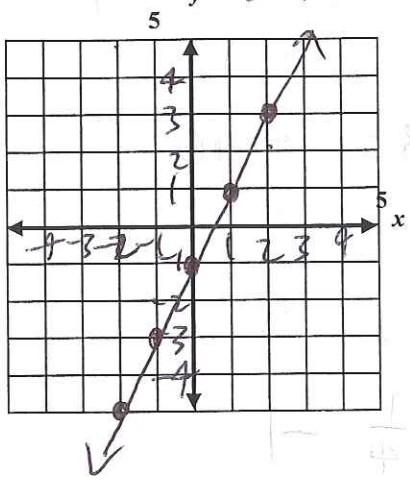
x	y
-2	-5
-1	-3
0	-1
1	1
2	3

+2, +2, +2, +2

FIRST DIFFERENCES ARE EQUAL

$y = 2x - 1$

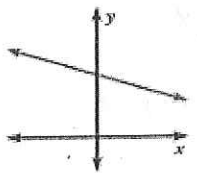
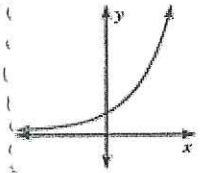
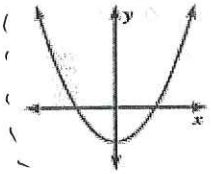
CONSTANT SLOPE



LINEAR

KEY CONCEPT *For Your Notebook*

Linear, Exponential, and Quadratic Functions

Linear Function	Exponential Function	Quadratic Function
$y = mx + b$	$y = ab^x$	$y = ax^2 + bx + c$
		

m = CONSTANT SLOPE ; a = Y-INTERCEPT

b = Y-INTERCEPT ; b = CONSTANT RATIO

Linear

A table of values represents a linear function if the **differences of successive y-values are all equal**.

Exponential

A table of values represents an exponential function if the **ratios of successive y-values are all equal**.

Quadratic

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

Homework

New: Pg. 688 #3-5 (all), 6-20 (evens)

Review:

Solve

1. $3(2x - 1) = 4x + 7$
2. $(x + 2)(x - 3) = 6$
3. $2u(u + 3) = 8$
4. $(x - 2)^2 = (x + 3)(x - 1)$