Name Key _____ Period _____ Date _____

Recognizing Relationships in Data Tables

For each of the tables below, determine what type of relationship is represented (linear, exponential, or unknown). Write an equation if linear or exponential, if unknown provide evidence why it is neither linear nor exponential. Show that your equation is correct by checking with **at least** two data points from the table.

Be efficient! Using algebra can be quicker than counting back to 0 to find the y- intercept.

1.

x	y
0	1.2
1	3.6
2	10.8
3	32.4

y-int

+1 → ×3
+1 → ×3
+1 → ×3

Exponential

$y = 1.2(3^x)$

2.

x	y
3	100
4	75
5	60
6	50

+1 → −25 → ×.75
+1 → −15 → ×.8
+1 → −10 → ×.83

Not Linear – no constant slope

Not Exponential – no constant factor

UNKNOWN

3.

x	y
17	−17
18	−19
19	−23
20	−27

+1 → −2 → ×1.12
+1 → −4 → ×1.21
+1 → −4 → ×1.17

Not Linear – no constant slope $-\frac{2}{1} \neq -\frac{4}{1}$

Not Exponential – no constant growth factor

UNKNOWN

4.

x	y
2	24.5
3	171.5
4	1200.5
5	8403.5

+1 → ×7
+1 → ×7
+1 → ×7

$y = a \cdot 7^x$

$\frac{24.5}{7^2} = \frac{a \cdot 7^2}{7^2}$

$0.5 = a$

Exponential

$y = 0.5(7^x)$

5.

x	y
15	28,697,814
16	86,093,442
17	258,280,326
18	774,840,978

+1 → ×3
+1 → ×3
+1 → ×3

Exponential

$y = 2(3^x)$

$y = a(3^x)$

$\frac{28,697,814}{3^{15}} = \frac{a(3^{15})}{3^{15}}$

$2 = a$

6.

x	y
20	25
26	27
35	30
38	31

+6 → +2
+9 → +3
+3 → +1

$\frac{\Delta y}{\Delta x} = \frac{2}{6} = \frac{3}{9} = \frac{1}{3}$

$y = \frac{1}{3}x + b$

$25 = \frac{1}{3}(20) + b$

$\frac{75}{3} = \frac{20}{3} + b$

$-\frac{20}{3} \quad -\frac{20}{3}$

$\frac{55}{3} = b$

Linear

$y = \frac{1}{3}x + \frac{55}{3}$

7.

x	y
20	63,250
30	50,750
40	38,250
60	13,250

+10 → −12,500
+10 → −12,500
+20 → −25,000

$\frac{\Delta y}{\Delta x} = \frac{-25,000}{20} = \frac{-12,500}{10} = -1250$

$y = -1250x + b$

$63,250 = -1250(20) + b$

$63,250 = -25,000 + b$

$+25,000 \quad +25,000$

$88,250 = b$

Linear

$y = -1250x + 88,250$

8.

x	y
20	10,485.76
21	20,971.52
22	41,943.04
23	83,886.08

+1, +1, +1 → ×2, ×2, ×2

$y = a(2^x)$

$\frac{10,485.76}{2^{20}} = \frac{a(2^{20})}{2^{20}}$

$0.01 = a$

Exponential

$y = 0.01(2^x)$

9.

x	y
4	192
6	3072
8	49,152
10	786,432

+2, +1, +2 → ×16=4·4, ×16=4·4, ×16=4·4

$y = a(4^x)$

$\frac{192}{4^4} = \frac{a(4^4)}{4^4}$

$.75 = a$

Exponential

$y = 0.75(4^x)$

10.

x	y
20	4.0
22	4.8
24	5.6
30	8.0

+2, +2, +6 → +.8, +.8, +2.4

$\frac{\Delta y}{\Delta x} = \frac{.8}{2} = \frac{2.4}{6} = 0.4$

$y = 0.4x + b$

$4 = 0.4(20) + b$

$4 = 8 + b$

$-8 \quad -8$

$-4 = b$

Linear

$y = 0.4x - 4$

11.

x	y
–4	5
–2	10
2	–10
4	–5

+2, +4, +2 → +5, −20, +5 → ×2, ×−1, ×−.25

Not Linear – no constant slope $\frac{\Delta y}{\Delta x} = \frac{5}{2} \neq \frac{-20}{4} \neq \frac{5}{2}$

Not Exponential – no constant growth factor

UNKNOWN

12.

x	y
20	5
27	7
41	11
48	13

+7, +14, +7 ; +2, +4, +2

$\frac{\Delta y}{\Delta x} = \frac{2}{7} = \frac{4}{14} = \frac{2}{7}$

$y = \frac{2}{7}x + b$

$5 = \frac{2}{7}(20) + b$

$5 = \frac{40}{7} + b$

$\frac{35}{7} = \frac{40}{7} + b$

$-\frac{40}{7} \quad -\frac{40}{7}$

$-\frac{5}{7} = x$

Linear

$y = \frac{2}{7}x - \frac{5}{7}$

13.

x	y
0	3
1	4
2	11
3	30

+1, +1, +1 ; +1, +7, +19 ; $\times\frac{4}{3}$, $\times\frac{11}{4}$, $\times\frac{30}{11}$

Not Linear – no constant slope $\frac{\Delta y}{\Delta x} = \frac{1}{1} \neq \frac{7}{1} \neq \frac{19}{1}$

Not Exponential – no constant growth factor

$\frac{4}{3} \neq \frac{11}{4} \neq \frac{30}{11}$

UNKNOWN

14.

x	y
3	12.8
5	204.8
7	3,276.8
9	52,428.8

+2, +2, +2 ; ×16, ×16, ×16

$y = a(4^x)$

$\frac{12.8}{4^3} = \frac{a(4^3)}{4^3}$

$0.2 = a$

Exponential

$y = 0.2(4^x)$

15.

x	y
2	4.8
5	38.4
8	307.2
11	2,457.6

+3, +3, +3 ; ×8, ×8, ×8

$y = a(2^x)$

$\frac{4.8}{2^2} = \frac{a(2^2)}{2^2}$

$1.2 = a$

Exponential

$y = 1.2(2^x)$