Name _____ Date _____ Period _____

## Learning Goal 12 – Exponential Functions Review

I understand specific terminology such as Exponential Growth/Exponential Decay, Multiplier, Growth Factor, Exponent, Exponential Equation

1. Determine if the following patterns are exponential, linear, or other and show the pattern

a.

| X | Y |
|---|---|
| 0 | 1.5 |
| 1 | 4.5 |
| 2 | 13.5 |
| 3 | 40.5 |

$\frac{4.5}{1.5} = 3$ $\frac{13.5}{4.5} = 3$

Type: exponential growth
Pattern: ×3

b.

| X | Y |
|---|---|
| 0 | 24 |
| 1 | 18 |
| 2 | 12 |
| 3 | 6 |

Type: linear
Pattern: −6

c.

| X | Y |
|---|---|
| -1 | 10 |
| 0 | 8 |
| 1 | 6.4 |
| 2 | 5.12 |
| 3 | 4.096 |

×0.8 ×0.8

Type: exponential decay
Pattern: ×0.8

d.

| X | Y |
|---|---|
| 0 | 1 |
| 1 | 2 |
| 2 | 4 |
| 3 | 9 |
| 4 | 16 |

not ×2

Type: other
Pattern: _____

e.

| X | Y |
|---|---|
| -1 | 1.25 |
| 0 | 1.5 |
| 1 | 1.75 |
| 2 | 2 |
| 3 | 2.25 |

+0.25 +0.25

Type: linear
Pattern: +0.25

I can identify the initial value and calculate the multiplier from an equation, table, or graph.

I know what kind of multiplier causes growth or decay.

2. Determine the initial value, the factor, and if the equation is growth or decay from the equation

a. $y = 3\left(\frac{2}{5}\right)^x$
Growth or Decay: decay
(starting) Initial value = 3
(multiplier) Factor = $\frac{2}{5}$

b. $y = 2.5(6)^x$
Growth or Decay: growth
Initial value = 2.5
Factor = 6

c. $y = 256(0.82)^x$
Growth or Decay: decay
Initial value = 256
Factor = 0.82

3. Determine the initial value, the factor, and if the equation is growth or decay from the table

a.

| X | Y |
|---|---|
| 0 | 6 |
| 1 | 18 |
| 2 | 54 |
| 3 | 162 |
| 4 | 486 |

×3 ×3

Growth or Decay: growth
Initial value = 6
Factor = 3

b.

| X | Y |
|---|---|
| 0 | 4 |
| 1 | 6 |
| 2 | 9 |
| 3 | 13.5 |
| 4 | 20.25 |

$\frac{6}{4} = \frac{3}{2}$ $\frac{9}{6} = \frac{3}{2}$

Growth or Decay: growth
Initial value = 4
Factor = $\frac{3}{2}$

c.

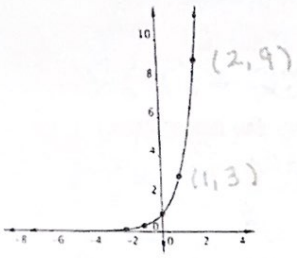
| X | Y |
|---|---|
| -1 | 50 |
| 0 | 10 |
| 1 | 2 |
| 2 | 0.4 |
| 3 | 0.08 |

×$\frac{1}{5}$ ×$\frac{1}{5}$

Growth or Decay: decay
Initial value = 10
Factor = $\frac{1}{5}$

Determine the initial value, the factor, and if the equation is growth or decay from the graph

a.

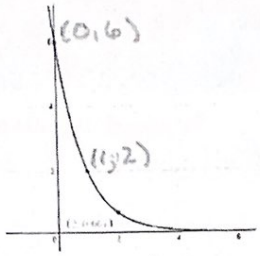



Growth or Decay: growth

Initial value = 1

Factor = 3

b.

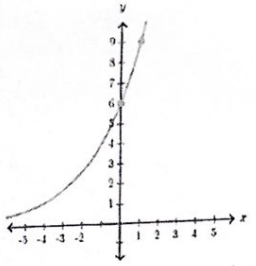



Growth or Decay: decay

Initial value = 6

Factor = $\frac{1}{3}$

c.



Growth or Decay: growth

Initial value = 6

Factor = $\frac{3}{2}$ $\frac{9}{6} = \frac{3}{2}$

I can create an exponential equation given a graph, a table, or a situation and use it to solve a real world problem.

4. Write an exponential equation for the graphs above

a. $f(x) = 1 \cdot 3^x$ $f(x) = 3^x$

b. $f(x) = 6\left(\frac{1}{3}\right)^x$

c. $f(x) = 6\left(\frac{3}{2}\right)^x$

5. Write an exponential equation for the table and complete the missing values

a.

| X | Y |
|---|---|
| 0 | 36 |
| 1 | 6 |
| 2 | 1 |
| 3 | $\frac{1}{6}$ |
| 4 | $\frac{1}{36}$ |

$\frac{6}{36} = \frac{1}{6}$

Initial value = 36

Factor = $\frac{1}{6}$ multiplier

Equation: $f(x) = 36\left(\frac{1}{6}\right)^x$

b.

| X | Y |
|---|---|
| 0 | 1.5 |
| 1 | 3 |
| 2 | 6 |
| 3 | 12 |
| 4 | 24 |

Initial value = 1.5

Factor = 2

Equation: $f(x) = 1.5(2)^x$

c.

| X | Y |
|---|---|
| -1 | 12 |
| 0 | 14.4 |
| 1 | 17.28 |
| 2 | 20.736 |
| 3 | 24.8832 |

$\times 1.2$

Initial value = 14.4

Factor = 1.2

Equation: $f(x) = 14.4(1.2)^x$

d.

| X | Y |
|---|---|
| 0 | $\frac{7}{3}$ |
| 1 | 7 |
| 2 | 21 |
| 3 | 63 |
| 4 | 189 |

$\times 3$ $\times 3$

Initial value = $\frac{7}{3}$

Factor = 3

Equation: $f(x) = \frac{7}{3}(3)^x$

6. Write an exponential equation for the situations and answer the questions

a. A new car initially costs $22,000. The value of the car goes down 4.5% each year.

i. Write an equation for the value of the car

$a = 22{,}000$

$r = 0.045 \quad b = 1 - 0.045 = 0.955$

$f(x) = 22000(0.955)^x$

ii. How much will the car be worth in 5 years?

$f(5) = 22000(0.955)^5$

$f(5) = \$17{,}475.90$

b. Jen gets a loan from the bank for $12,000. The loan grows at a rate of 5.2% per month from interest.

i. Write an equation for the money owed on the loan

$a = 12000 \quad r = 0.052 \quad b = 1 + 0.052 = 1.052$

$f(x) = 12000(1.052)^x$ ← months

ii. How much will Jen owe on the loan in 2 years?

12 months per yr

$f(2) = 12000(1.052)^{24}$ ← 24 months

$= \$40{,}509.70$

c. A doctor finds a tumor in a patient. The table below shows the size of the tumor each week

i. Write an equation for the tumor growth

$b = \frac{25.11}{55.80} = 0.45$

$a = \frac{55.8}{0.45} = 124$

$f(x) = 124(0.45)^x$

| X (weeks) | Y (tumor size in micrometers) |
|---|---|
| 0 | 124 |
| 1 | 55.8 |
| 2 | 25.11 |
| 3 | 11.299 |
| 4 | 5.085 |

ii. How big will the tumor be in 6 weeks?

$f(6) = 124(0.45)^6$

$\approx 1.03$ micrometers

7. Determine if each sequence is arithmetic, geometric, or neither + why.

a. 2, 6, 16, 18, 30, … (+4, +10)

* not a common difference

$\frac{6}{2} = 3 \quad \frac{16}{6} = \frac{8}{3}$ not a common ratio

b. -4, -7, -10, -13, … (-3, -3, -3)

arithmetic

The common difference is -3

c. -2, 0, 2, 6, 14, … (+2, +2, +4)

not common difference

no common ratio

$\frac{6}{2} = 3 \quad \frac{14}{6} = \frac{7}{3}$

8. Determine the common ratio and the next three terms for each geometric sequence

a. .375, 3, 24, 192, 1536, 9608, 13824 (×8)

$\frac{3}{0.375} = 8 \quad \frac{24}{3} = 8$

common ratio: 8

$a_n = 0.375(8)^{n-1}$

b. 7, -14, 28, -56, 112, -224, 448 (×-2, ×-2)

common ratio: -2

$a_n = 7(-2)^{n-1}$

c. 1024, 128, 16, 2

Write the equation

$\frac{128}{1024} = \frac{1}{8} \quad \frac{2}{16} = \frac{1}{8}$

$a_n = 1024\left(\frac{1}{8}\right)^{n-1}$