

Exponential Growth and Decay Practice

Name: _____

Growth:

$$y = a(1+r)^x$$

Decay:

$$y = a(1-r)^x$$

a = initial **amount** before measuring growth/decay

r = growth/decay **rate** (often a percent)

x = number of **time** intervals that have passed

- 1) Given the equation $y = 225(1.23)^x$
- Does this equation represent growth or decay?
 - What is the rate of growth or decay?
 - What is the initial value?
 - Evaluate for $x = 2$

$$\begin{array}{r} \text{growth} \\ \hline 23\% \\ \hline 225 \\ \hline 340.40 \end{array}$$

- 2) Given the equation $y = 154(1.06)^x$
- Does this equation represent growth or decay?
 - What is the rate of growth or decay?
 - What is the initial value?

$$\begin{array}{r} \text{growth} \\ \hline 6\% \\ \hline 154 \end{array}$$

- 3) Given the equation $y = 35(0.57)^x$
- Does this equation represent growth or decay?
 - What is the rate of growth or decay?
 - What is the initial value?
 - Evaluate for $x = 3$

$$\begin{array}{r} \text{decay} \\ \hline 43\% \\ \hline 35 \\ \hline 6.48 \end{array}$$

For each word problem write the exponential equation to model the situation.

- 4) A zombie infection in Duluth High School grows by 15% per hour. The initial group of zombies was a group of 4 freshmen. How many zombies are there after 6 hours?

$$y = 4 \cdot 1.15^x$$

$$y = 9.25 \rightarrow 9 \text{ zombies}$$

- 5) Ryan is saving for his college tuition. He has \$2,550 in a savings account that pays 6.25% annual interest.

$$y = 2550 \cdot 1.0625^x$$

$$y =$$

6) Cars depreciate in value over time. A used car was purchased for \$12,329 this year. Each year the car's value decreases 8.5%.

$$y = 12,329 \cdot .915^x$$

7) Jeremiah owns a side business detailing cars. His first year he made \$10,500 and each of the following years his profit increased 9%.

$$y = 10,500 \cdot 1.09^x$$

8) There are 128 teams entered in a basketball tournament. Half of the teams are eliminated each round. How many teams are left after 4 rounds?

$$y = 128 \cdot .5^x$$

$$y = 128 \cdot .5^4$$

$$y = 8$$

9) Bacteria in a dirty glass triple every hour. If there are 25 bacteria to start, how many in the glass after 1 day?

$$y = 25 \cdot 3^x$$

$$y = 25 \cdot 3^{24}$$

$$y = 7,060,738,412,000$$

10) The population of a city of 750,000 people is devastated by an unknown virus that kills 20% of the population per day. How many people are left after a week?

$$y = 750,000 \cdot .8^x$$

$$y = 750,000 \cdot .8^7$$

$$y = 157,296$$

11) There are 1,750,235 acres of forest in northwestern Idaho. One-half percent of the forest is destroyed by pollution every year. How many acres are left after 65 years?

$$y = 1,750,235 \cdot .995^x$$

$$100 - .5 = 99.5$$

$$y = 1,263,562.2$$

12) A new Ipod is estimated to lose 25% of its value every six months after purchase. How much is the value of an Ipod that costs \$299 after someone has owned it for 2 years?

$$y = 299 \cdot .75^x$$

$$y = 299 \cdot .75^4$$

$$y = 94.61$$

13) A recent college graduate accepts a job at Google Inc. The job has a salary of \$47,000 and is guaranteed an annual pay increase of 3%.

$$y = 47,000 \cdot 1.03^x$$

14) A pawn shop is trying to sell a big screen TV. The owner decides to set the price at \$1,250 and decrease the price by 4.5% after every week it doesn't sell.

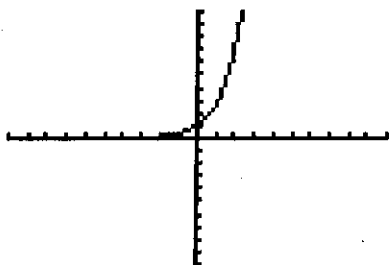
$$y = 1,250 \cdot .955^x$$

Exponential Growth and Decay
Review – All Sections

Name _____
Date _____

Identify each as growth or decay.

1.



- a) growth
- b) decay

2.

x	y
0	125
1	25
2	5
3	1
4	0.2

- a) growth
- b) decay

3. $y = (\frac{4}{7})^x$

Growth or decay? *decay*

Factor: $\frac{4}{7}$

Rate: $\frac{3}{7} = 42.9\%$

Initial Value: *1*

4. $y = .75 \cdot (2.4)^x$

Growth or decay? *growth*

Factor: *2.4*

Rate: *140%*

Initial Value: *.75*

5. Given $y = 2(3)^x$, identify the following:

What is the initial value? *2*

What is the growth/decay factor? *3*

What is the growth/decay rate? *200%*

Table #1:

x	y
-1	0.5
0	2
1	8
2	32
3	128

1. Growth/Decay Factor: Growth

2. Growth/Decay Rate: 300%

3. Initial Value: 2

4. Write the equation of the exponential function:

$$y = 2 \cdot 4^x$$

Table #2:

x	y
2	4
3	2
4	1
5	0.5
6	0.25

5. Growth/Decay Factor: decay

6. Growth/Decay Rate: 50%

7. Initial Value: 16

8. Write the equation of the Exponential Function:

$$y = 16 \cdot .5^x$$

7. An initial population of 5 squirrels increases by 9% each year for 10 years. Using x for years and y for the number of squirrels, write the equation that models this situation.

$$y = 5 \cdot 1.09^x$$

How many squirrels will there be in 10 years? 11.8 → 11 squirrels

8. A car purchased for \$34,000 is expected to lose value, or depreciate, at a rate of 6% per year. Using x for years and y for the value of the car, write the equation that models this situation.

$$y = 34,000 \cdot .94^x$$

After how many years is the car first worth less than \$21,500?

B/w 7-8 yrs

Answers to (ID: 1)

- | | | | |
|---|----------------------------------|---|-------------|
| 1) 1.05 | 2) 0.88 | 3) 1.3 | 4) 0.02 |
| 5) 0.99 | 6) 4 | 7) 1.0085 | 8) 0.975 |
| 9) 3 | 10) $\frac{1}{2}$ | 11) Growth | 12) Decay |
| 13) Growth | 14) Decay | 15) Growth | 16) Decay |
| 17) 5,440 ; 23,925,373,020,405,760 | | 18) \$6,100 ; \$9,079.24 | |
| 19) Approximately 816 | | 20) 2012: \$6,994.77 2020: \$3,914.15 | |
| 21) $y = 1400 \cdot 1.09^t$; \$12,072.31 | | 22) $y = 1300 \cdot 0.99^t$; Approx. 1200 people | |
| 23) Approximately \$25,471.55 | 24) Approximately \$2540.22 | 25) Approximately \$23,440.68 | |
| 26) Approximately \$1,161.18 | 27) No solution. | 28) $\left\{-\frac{2}{3}\right\}$ | |
| 29) $\{-2\}$ | 30) $\left\{\frac{1}{2}\right\}$ | 31) $\left\{-\frac{5}{6}\right\}$ | 32) $\{0\}$ |
| 33) $\{0\}$ | 34) $\left\{\frac{1}{5}\right\}$ | | |