Warmup:

Solve the following equations:

$(8)^{r-2} = (16)$

$(2^3)^{r-2} = 2^4$

$2^{3r-6} = 2^4$

$3r - 6 = 4$

$3r = 10$

$r = 10/3$

$(25)^{3v-2} = (625)$

$(5^2)^{3v-2} = 5^4$

$5^{6v-4} = 5^4$

$6v - 4 = 4$

$6v = 8$

$v = \frac{8}{6} = \frac{4}{3}$

A

1) $32^{-b} = 4^{3b-1}$

$(2^5)^{-b} = (2^2)^{3b-1}$

$2^{-5b} = 2^{6b-2}$

$-5b = 6b - 2$

$-11b = -2$

$b = 2/11$ ★

2) $243^{-2m+1} = 27$

$(3^5)^{-2m+1} = 3^3$

$3^{-10m+5} = 3^3$

$-10m + 5 = 3$

$-10m = -2$

$m = 1/5 = .2$

3) $27^{-2p-3} = 81^{-2p-3}$

$(3^3)^{-2p-3} = (3^4)^{-2p-3}$

$3^{-6p-9} = 3^{-8p-12}$

$-6p - 9 = -8p - 12$

$2p = -3$

$p = -3/2 = -1.5$

4) $16^{2-3n} = 64$

$(4^2)^{2-3n} = 4^3$

$4^{4-6n} = 4^3$

$4 - 6n = 3$

$-6n = -1$

$n = 1/6$ ★

5) $36^{3a+1} = 216^{-a}$

$(6^2)^{3a+1} = (6^3)^{-a}$

$6^{6a+2} = 6^{-3a}$

$6a+2 = -3a$

$2 = -9a$

$a = -2/9$

6) $25^{-x-2} = 125$

$(5^2)^{-x-2} = 5^3$

$5^{-2x-4} = 5^3$

$-2x-4 = 3$

$-2x = 7$

$x = -7/2$

7) $9^{-3n} = 27$

$(3^2)^{-3n} = 3^3$

$3^{-6n} = 3^3$

$-6n = 3$

$n = -1/2$

8) $3^{-3x} = 9$

$3^{-3x} = 3^2$

$-3x = 2$

$x = -2/3$

9) $6^{-x} = 6^3$

$-x = 3$

$x = -3$

10) $4^{3p+1} = 2^3$

$(2^2)^{3p+1} = 2^3$

$2^{6p+2} = 2^3$

$6p + 2 = 3$

$6p = 1$

$p = 1/6$

11) $6^{-2v-3} = 216$

$6^{-2v-3} = 6^{3}$

$-2v-3 = 3$

$-2v = 6$

$v = -3$

12) $3^{-3v} = 3^{-v}$

$-3v = -v$

$+v \quad +v$

$-2v = 0$

$-2 \quad -2$

$v = 0$

13) $81^{-3x} = 27$

$(3^4)^{-3x} = 3^{3}$

$3^{-12x} = 3^{3}$

$-12x = 3$

$x = -1/4$

14) $5^{-3m+1} = 5^{2m}$

$-3m+1 = 2m$

$1 = 5m$

$m = 1/5$

Quiz #10 Tomorrow!

- Sequences
- Graphing with and without Transformations
- Characteristics of Exponential Functions

Essential Question:
How can I solve real world problems involving exponential growth and decay?

similar

* $y = a \cdot b^{x}$

** $y = a \cdot b^{x-h} + k$

Sequence

$a_n = a_{n-1} \cdot r$: recursive formula

$a_n = a_1 \cdot (r)^{n-1}$: explicit formula

Exponential Growth/Decay Applications

- Many real world phenomena can be modeled by functions that describe how things grow or decay as time passes. Examples of such phenomena include the studies of populations, bacteria, the AIDS virus, radioactive substances, electricity, temperatures and credit payments, to mention a few.

-Any quantity that increases by a fixed percent at regular intervals is said to possess exponential growth.

-Any quantity that decreases by a fixed percent at regular intervals is said to possess exponential decay.

$(y = a \cdot b^x)$

Models for growth and decay:

Exponential Growth:

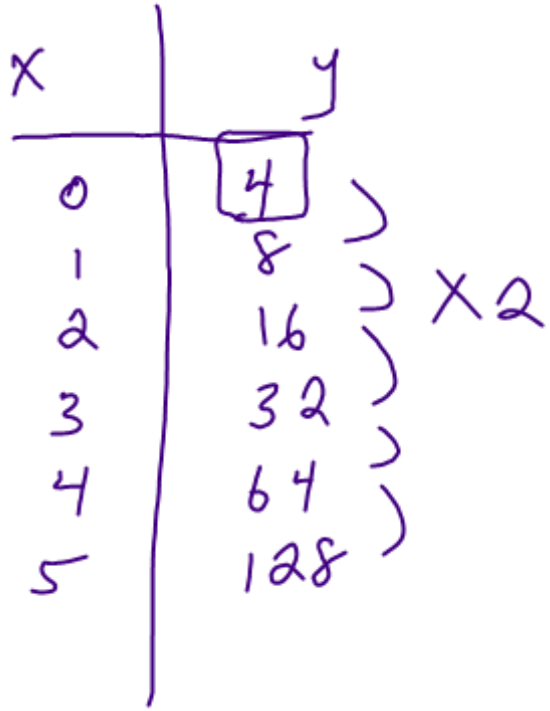
$$P_t = P_0(1 + r)^t$$

Exponential Decay:

$$P_t = P_0(1 - r)^t$$

$P_t =$ value at any given time. $r =$ rate of growth/decay (use decimal)

$P_0 =$ Initial value. $t =$ time value



$$y = 4\left(\frac{2}{1}\right)^{x}$$

Example 1: The foundation of your house has about 1,200 termites. The termites grow at a rate of about 2.4% per day. Develop a model to track the population of termites.

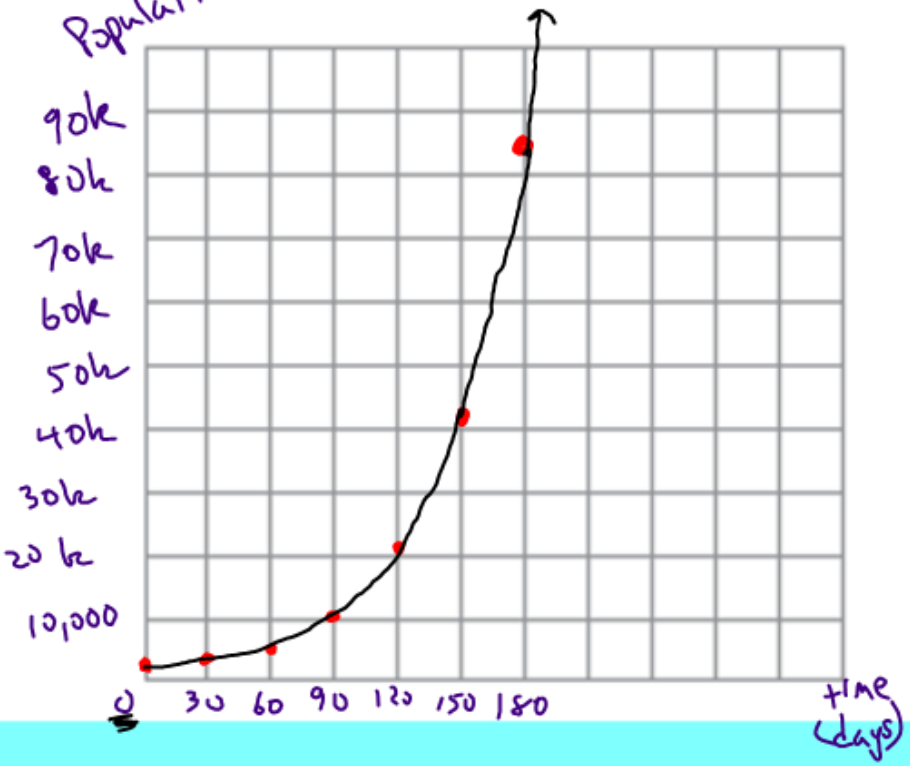
Model: ↳ write an equation.

$$P_t = 1200(1 + .024)^t$$

2.4% → .02.4% → decimal 2 places left.

$2.4\% = \frac{2.4}{100} = .024$

Time (day)	Population
0	1200
30	2444
60	4979
90	10,143
120	20,662
150	42,090
180	85,738

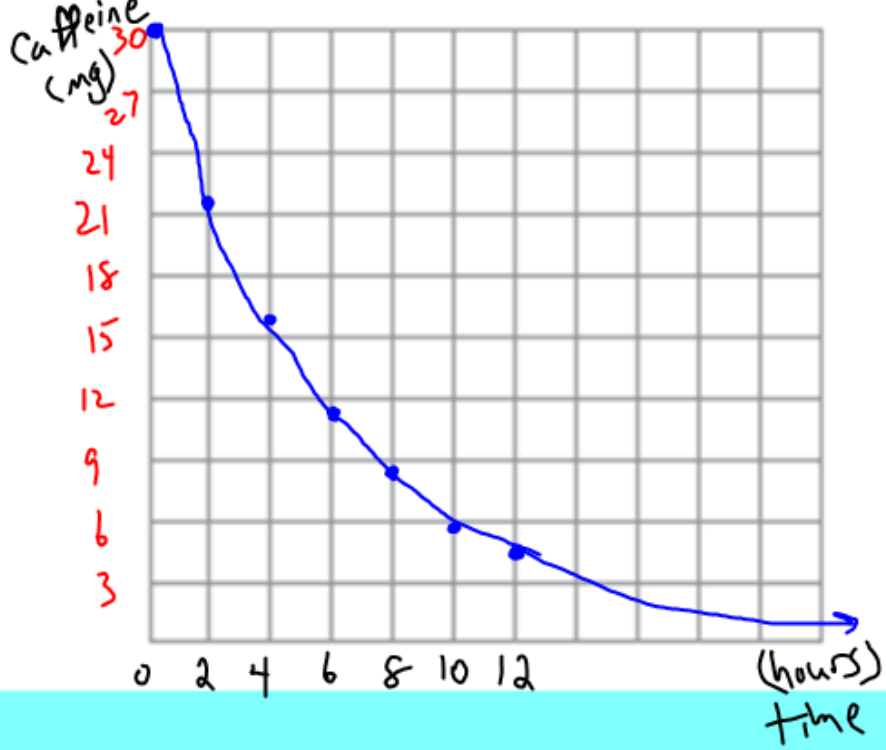


decay

Example 2: The rate at which caffeine is eliminated from the bloodstream of an adult is about 15% per hour. An adult drinks a caffeinated soda, and the caffeine in his or her bloodstream reaches a peak level of 30 milligrams.

Model: $P_t = 30(1 - .15)^t$

Time (hr)	Caffeine Remaining(mg)
0	30
2	21.7
4	15.7
6	11.3
8	8.2
10	5.9
12	4.3



Exponential Growth and Decay Classwork

- Get into groups of no more than 4 people
- For your assigned problem do each of the following:
  - Create a table
  - Create a graph
  - Create an Equation
- Answer the questions

Your work will be displayed on poster paper.

It is your responsibility to capture the equations and answers for each of the remaining examples and to verify those solutions.

HW #5

Exponential Growth and Decay