Lesson 5.10 Applications of Exponential Equations

Goal: Model and solve real world applications in exponential growth and decay

Exponential relations are modelled by the exponential equation ______________________________, where

a is the _____________________________________

b is the _____________________________________

$b > 1$ models _________________________

$0 < b < 1$ models ______________________

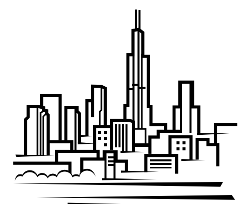
Real-world applications of exponential growth or decay may require solving the equation $y = ab^x$ for x

EXAMPLE 1*: *Guess & Check

Ontario's population can be modelled by the equation $P = 9.4(1.0125)^t$, where *P* represents the population in millions *t* years after 1985. In which year did the population first exceed 10 million?

Beginning population: ____________________ Ending population: ____________________

Population is growing at a rate of: ____________________



Sub in the info given:

Simplify:

Use a ***TABLE OF VALUES*** to ***GUESS & CHECK*** a solution

EXAMPLE 2: Using a Graph

Redo example 1, but this time find the point of intersection in order to solve.

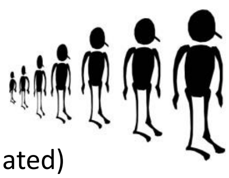
- Graph the exponential equation
- Graph the line P = 10 000 000
- Where do they meet?

TWO SPECIAL EXPONENTIAL GROWTH & DECAY EQUATIONS

DOUBLING:

A_0 = Initial Amount

A = Final Amount



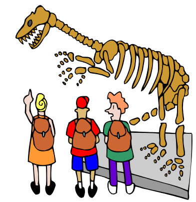
t = time (measured or calculated)

$\boldsymbol{d} =$

HALF-LIFE:

A_0 = Initial Amount

A = Final Amount



t = time (measured or calculated)

$\boldsymbol{h} =$

EXAMPLE 3: Solving an Application Involving Doubling Time

A bacteria culture doubles in size approximately every 14 hours. Suppose this bacteria culture started with 100 individual bacteria. How long will it take for the bacteria population to reach 1000 individuals? Give your answer to one decimal place.

EXAMPLE 4: Solving Applications Involving Half-Life

Caffeine has a half-life of approximately 5 hours. Suppose you drink a cup of coffee that contains 200 mg of caffeine. How long will it take until there is less than 10 mg of caffeine left in your bloodstream?

Practice: Page 391 #1ac, 3ac, 8, 11b, 12bc, 14, 17, 21