

UNIT 5: EXPONENTIAL AND LOGARITHMIC FUNCTIONS

WEEK 16: DAY 1 - EXPONENTIAL GROWTH

What is an exponential functions? i.e. $y=2^x$

- occurs in problems of population, growth, compound interest, investment growth, inflation rates and bacterial growth

Growth Curve:

In a bacterial culture there is a time when there will be **twice** as many bacteria as at the start. This is called the **DOUBLING PERIOD**.

Growth Curve - Doubling Period

i.e. 5 bacteria in a culture with a doubling period of 1 day.

After 1 day

2 days

3 days

10 days

"n" days

FORMULA:

COMPOUND INTEREST FORMULA:

EXPONENTIAL GROWTH

Ex. 1) A biologist makes a sample count of bacteria in a culture and finds that it doubles every 3 hours. The estimated count after 6 hours was 10 000.

- A) What was the initial size of the culture at $t = 0$?
- B) What was the estimated count after 1 day?

Ex. 2) the population (P millions) of Alberta can be modelled by the equation

$P=2.28(1.014)^n$ where “ n ” is the number of years since 1981. Determine when the population of alberta might become 4 million. What assumptions did you have to make?

Ex. 3) In 1995, Canada's population was 29.6 million people, and was growing at about 1.24% per year. Estimate the doubling time for Canada's population growth.

EXPONENTIAL DECAY

DECAY CURVE: Radioactive matter

HALF LIFE: period of time during which a given amount of radioactive matter decays to $\frac{1}{2}$ that amount.

DECAY CURVE-HALF LIFE

I.e. Radioactive Bismuth-Radium E has a half life of 5 days, start with 1 unit of Radium E...

After 5 days

After 10 days

After 15 days

FORMULA:

Ex. 1) Consider the equation $P=100(0.87)^n$ that models the percent of caffeine in your body "n" hours after consumption. Write this equation as an exponential function with $\frac{1}{2}$ as the base instead of 0.87.

Ex. 2) In April 1986, there was a major nuclear accident at the Chernobyl power plant in Ukraine. The atmosphere was contaminated with quantities of radioactive iodine-131, which has a half life of 8.1 days. How long did it take for the level of radiation to reduce to 1% of the level immediately after the accident?