Objective 3 - Construct Log/Exp Models

Link to textbook: Construct a model equation for the real-life situation.

Videos:

- pH
- Age using Half-Life
- Doubling time growth pt. 1
- Doubling time growth pt. 2
- Radioactive Decay and Law of Cooling

Question 1 *A population of bacteria* `quadruples` *every hours. If the culture started with* 300*, write the equation that models the bacteria population after* t *hours.*

$P(t) = \boxed{300}\boxed{4}^{\boxed{t}}$

Question 2 *There is initially* 351 *grams of element* X*. The half-life of element* X *is* 72226 *years. Describe the amount of element* X *remaining as a function of time,* t*, in years.*

$X(t) = \boxed{351}\boxed{e}^{\boxed{-\frac{1}{72226}\log(2)}t}$

Question 3 *The half-life of carbon-14 is 5,730 years.*

Part A. *Describe the amount of carbon-14 remaining after* t *years. The initial amount of carbon-14,* C_0*, is already included below.*

$C(t) = C_0 * \boxed{e}^{\boxed{-0.000120968094338559}t}$

Part B. *Solve the equation above for* t *written in terms of the ratio of carbon-14 remaining,* $r = \dfrac{C}{C_0}$.

Learning outcomes:
Author(s): Darryl Chamberlain Jr.

$t(r) = \boxed{-8266.64258429376}\ln(\boxed{r})$

Part C. *The equation above is used to carbon-date objects. To solidify this idea, use the model in Part B. to solve the following problem.*

A bone fragment is found that contains 34% of its original carbon-14. To the nearest year, how old is the bone?

$\boxed{8918}$ *years old*