

PRE-AP ALGEBRA 2

- 1) In 2000, the population of Atlanta, GA was 0.419 million people. In 2020, it was 0.499 million. Estimate in what year the population of Atlanta will be 0.6 million.

$$t=0 \rightarrow 2000 \quad t=20 \rightarrow 2020$$

$$p = p_0 e^{kt}, \quad p = 0.419 e^{kt}$$

$$0.499 = 0.419 e^{k(20)}$$

$$e^{20k} = \frac{0.499}{0.419}, \quad 20k = \ln\left(\frac{0.499}{0.419}\right),$$

$$k = \frac{1}{20} \ln\left(\frac{0.499}{0.419}\right) = 0.008736.../\text{yr}$$

$$0.6 = 0.419 e^{kt}, \quad e^{kt} = \frac{0.6}{0.419}$$

$$kt = \ln\left(\frac{0.6}{0.419}\right)$$

$$t = \frac{1}{k} \ln\left(\frac{0.6}{0.419}\right) = 41.10$$

$$+ 2000 = 2041 \leftarrow$$

3A.8 CLASSWORK

- 2) The half-life of Carbon-14 ($C-14$) is 5730 years. In Wyoming, a ~~mastodon~~ ^{woolly mammoth} bone was found that had 70% of its original $C-14$ decayed. How old is the bone?

$$k = \frac{\ln 2}{T} = \frac{\ln 2}{5730} = 1.2096... \times 10^{-4} / \text{yr}$$

$$70\% \text{ decayed} \Rightarrow 30\% \text{ present}$$

$$C = C_0 e^{-kt}, \quad 0.3 C_0 = C_0 e^{-kt},$$

$$0.3 = e^{-kt}, \quad -kt = \ln(0.3)$$

$$t = -\frac{1}{k} \ln(0.3) = 9953 \text{ yrs} \rightarrow$$