

BLC 190

Name: _____

Worksheet 7

1. Solve the following equations:

(a) $4^x = 2$

(b) $2^{3t} = 14$

(c) $2 \cdot 3^x - 3 = 5$

(d) $3e^{2t} - 2 = 7$

(e) $\sqrt{e^{4t}} = 3 - e^{2t}$

(f) $\log_5(2x + 1) = 2$

(g) $5 \ln x = 7$

(h) $\ln x = \ln 3 + \ln 5$

2. In 1920, Pearl and Reed proposed a model for the population of the United States based on the years 1790, 1850, and 1910. The function they proposed was

$$P(t) = \frac{2930}{0.0149 + e^{-0.0313t}}$$

where P is measured in thousands and t represents the number of years past 1790.

- (a) Based on the model, determine the population of the US in 1790, 1850, and 1910.

- (b) According to the model, in what year was the population 100 million?

- (c) According to the model, what is the eventual population of the United States?

3. At the beginning of a biology experiment, a bacteria culture contains 100 bacteria. An hour later, the number of bacteria has doubled.

(a) Assuming exponential growth, find a formula for the population of bacteria after t hours.

(b) How many bacteria will the culture contain after 4 hours?

(c) When will the culture contain 6400 bacteria?

4. At noon, a bacteria culture contains 5000 bacteria. After two hours the population has increased to 9890.

(a) Assuming exponential growth, find a formula for the population of bacteria after t hours.

(b) How many bacteria are in the culture at 7:30pm?

(c) At what time will the culture contain 100,000 bacteria?

5. Xanax is a tranquilizer used in the short-term relief of symptoms of anxiety. Its half-life in the bloodstream is 36 hours (meaning that after 36 hours, there is half as much in the bloodstream). Suppose that John initially has 1 mg of Xanax in his bloodstream.

(a) Find a formula for the amount of Xanax in John's bloodstream after t hours.

(b) How much Xanax is in John's bloodstream after 10 hours?

(c) How many days will it take for John's bloodstream to contain 0.03 mg of Xanax?