

## Precalculus: Chapter 3 Application Review

1. If you are investing money that is compounded continuously at 6.5%, how long will it take for your money to double?

$$2 = e^{.065t}$$

$$t = 10.66 \text{ yrs}$$

2. The voltage of a certain conductor decreases over time according to the law of uninhibited decay. If the initial voltage is 40 volts, and 2 seconds later it is 10 volts, what is the voltage after 5 seconds?

$$10 = 40e^{k(2)}$$

$$\frac{1}{4} = e^{2k}$$

$$k = -.69 \dots$$

$$A = 40e^{-.69 \dots (5)}$$

$$A = 1.25 \text{ volts}$$

3. The population of a colony of mosquitoes obeys the law of uninhibited growth. If there are 1000 mosquitoes initially and there are 1800 after 1 day, what is the size of the colony after 3 days? How long is it until there are 10,000 mosquitoes?

$$1800 = 1000e^{k(1)}$$

$$1.8 = e^k$$

$$k = .587 \dots$$

$$A = 1000e^{.587 \dots (3)}$$

$$A = 5832$$

$$10,000 = 1000e^{.587t}$$

$$10 = e^{.587t}$$

$$t = 3.917 \text{ days}$$

4. The logistic model  $W(t) = \frac{14,656.248}{1+0.059e^{0.057t}}$  represents the number of farm workers in the United States  $t$  years after 1910 (based on data obtained from the U.S. Department of Agriculture).

Find the number of farm workers in 1910.

$$W(0) = \frac{14656.248}{1+0.059e^{0.057(0)}} = 13839.71$$

13,839.71

How many farm workers were there in 1990 according to the model?

$$W(80) = \frac{14656.248}{1+0.059e^{0.057(80)}} = 2207$$

2207

How many farm workers are there in 2012 according to the model?

$$W(112) = \frac{14656.248}{1+0.059e^{0.057(112)}} = 705.9$$

705.9

When did the number of farm workers in the U.S. reach 10,000?

$$10000 = \frac{14656.248}{1+0.059e^{0.057t}}$$

36.2 yrs. since 1910

1946

What is the maximum number of farm workers in the U.S. according to this model?

14,656.248

$$1+0.059e^{0.057t} = \frac{14656.248}{10000}$$

$$1+0.059e^{0.057t} = 1.4656248$$

$$\frac{0.059e^{0.057t}}{0.059} = \frac{.4656248}{0.059}$$

$$e^{0.057t} = \frac{.4656248}{0.059}$$

$$\ln e^{0.057t} = \ln\left(\frac{.4656248}{0.059}\right)$$

$$.057t = \ln\left(\frac{.4656248}{0.059}\right)$$

$$t = \frac{\ln\left(\frac{.4656248}{0.059}\right)}{0.057}$$

$t \approx 36.2$  yrs.