Quiz 9 Math 211, Business Calc, Spring 2014 Name:
Section:

In 2010, aliens landed on Earth. Their initial population was 1,000 and it increased **exponentially**. In 2 years their population rose to 5,400. Consider the year 2010 as $t = 0$.

1. **Find the growth rate k (rounded to 3 decimals) using the information from above.**

   Our general formula is $P(t) = P_0 e^{kt} = 1000e^{kt}$, which is why we need to find k. We need k to finish the function.

   When $t = 2$, $P(2) = 5400$. Use this to find k.

$$\begin{aligned} P(2) &= 5400 \\ 1000e^{k\cdot 2} &= 5400 \\ e^{2k} &= 5.4 \\ \ln(e^{2k}) &= \ln(5.4) \\ 2k &= \ln(5.4) \\ k &= \ln(5.4)/2 \\ k &= 0.843 \text{ aliens per year} \end{aligned}$$

   Therefore, $P(t) = 1000e^{0.843t}$.

2. **How long until the population doubles?**

   If T is the doubling time, then

$$T = \frac{\ln 2}{k} = \frac{\ln 2}{0.843} = 0.82 \text{ years}$$

3. **What's their population in 2020?**

   In 2020, $t = 2020 - 2010 = 10$ years.

$$\text{In 2020: } P(10) = 1000e^{0843\cdot 10} = 4,582,500 \text{ aliens}$$

4. How fast will their population be increasing in 2020?

   We need $P'(t)$.

$$P'(t) = 1000e^{0.843t} \cdot (0.843) = 843e^{0.843t}$$

$$P'(10) = 843e^{0.43\cdot 10} = 3,863,047 \text{ aliens per year}$$