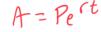
# Pre-Calculus CP 1 – Section 3.5 Day 2 HW Application Word Problems!



1. A deposit of \$10,000 is made in a savings account for which the interest is compounded continuously. The balance will double in 5 years. h = 0.000



A=2 P=1 t=5 a) What is the annual interest rate for this account?



b) Find the balance after 1 year.

2. The half-life of radioactive uranium II is 250,000 years. What percent of a present amount of radioactive uranium II will remain after 5000 years?  $A(t) = A_b e^{-t}$ 

$$\frac{1}{2} = e^{150,110 \text{ Je}}$$

$$k = \frac{10\frac{1}{2}}{150,000} = -0.0000027725887$$

$$A = e^{16(500)} \approx .98623 = 98.62\%$$

3. The population of South Carolina (in thousands) from 1990 through 2003 can be modeled by  $P(t)=3499e^{0.0135t}$ , where t is the time in years, with t=0 corresponding to 1990. According to this model, when will the population reach 4.5 million?

$$4500 = 3499e^{0.0135t}$$

$$\frac{4500}{3499} = e^{0.0135t}$$

$$t = \frac{\ln(\frac{4500}{3499})}{0.0135} \approx 18.64 \implies 2008$$

$$[990+18]$$

4. In a typing class, the average number N of words per minute typed after t weeks of lessons was found to be

$$N = \frac{157}{1 + 5.4e^{-0.12t}}$$

a) What is the carrying capacity for this problem?

b) Find the time necessary to type 50 words per minute

$$50 = \frac{157}{1 + 5.4e^{-0.12}t}$$

$$5.4e^{-0.12t} = \frac{157}{50} - \frac{50}{50} = \frac{107}{50}$$

$$e^{-0.12t} = \frac{107}{50} \cdot \frac{1}{5.4} = .3693$$

$$t^{2} \frac{\ln(.3693)}{-0.12} \approx 7.71 \text{ weeks}$$

5. The relationship between the number of decibels B and the intensity of a sound I in watts per square centimeter is  $B = 10 \log \left( \frac{I}{10^{-16}} \right)$ . Determine the intensity of a sound in watts per square centimeter if the decibel level is 125.

$$125 = 10 \log \left(\frac{I}{10^{-16}}\right)$$

$$12.5 = 10 g \left(\frac{I}{10^{-16}}\right)$$

$$12.5 = \frac{I}{10^{-16}}$$

$$I = \frac{10^{12.5}}{10^{16}} + 10^{-3.5} \frac{w}{cm^{2}}$$

- On a day a person is born, a deposit of \$50,000 is made in a trust fund that pays 8.75% interest, compounded continuously.

Find the balance on the person's 
$$35^{th}$$
 birthday.

$$50,000 = e^{.0875}(35)$$

How much longer would the person have to wait for the balance in the trust fund to double over the amount they have when they're 35?

$$2,138,094.28 = 50,000e$$
  
 $42.76 = e^{.0875}t$   
 $t = \frac{\ln(42.76)}{.0875} = 42.92 = 3 +3$   
 $43-35 \neq 8 \text{ more years}$ 

- Let Q represent a mass of plutonium 241 in grams, whose half-life is 14.4 years. The quantity of plutonium 241 present after t years is given by  $Q = 100 \left(\frac{1}{2}\right)^{714.4}$ 
  - Determine the initial quantity

$$Q = 100 \left(\frac{1}{2}\right)^{\circ} = 100 \text{ gms}$$

b) Determine the quantity present after 10 years.



8. The antler spread  $\mathbf{a}$  (in inches) and shoulder height  $\mathbf{h}$  (in inches) of an adult male American elk are related by the model  $h=116\log(a+40)-176$ . Approximate the shoulder height of a male American elk with an antler spread of 55 inches.

9. Mrs. Collins is making cookies and her kids love to eat them right away! She bakes them in a 350 degree (F) oven and when they are done she cools them in a 70 degree (F) room. Brady comes over and tries to take a bite one minute after she took them out of the oven but she shoos his hand away! They are much too hot to eat at a roasty 270 degrees (F)! He asks, "When can I come back and eat them?" If Mrs. Collins considers 150 degrees to be acceptable, what time should she tell him to return?

 $u(t) = T + (u_0 - T)e^{kt}$   $270 = 70 + (350 - 70)e^{k(1)}$   $\frac{200}{260} = \frac{5}{7} = e^{k}$  $k = |n| \le 1$ 

- | 150 = 70 + (280)e| 80 = 7 = e | (1n=7)t| 1n=7 = (1n=7)t| 1n=7 = (1n=7)t| 1n=7 = 23.7 = 14 mins
- 10. Suppose a body is 83°F at 10 PM and that the air temperature around it is 42°F. After one hour the body is found to be 76°F. Assuming the Estimate the time of death.

$$76 = 42 + (83 - 42)e^{k(1)}$$
  
 $34 = 41e^{k}$   
 $k = \ln(\frac{34}{41})$ 

Bady temp? 
$$(m(3))$$
t  
 $83 = 42 + (96.6 - 42)e$   
 $41 = 56.6e^{\ln(34)}t$   
 $t = \frac{\ln(41)}{\ln(34)} = 1.72 \text{ hrs}$   
 $\therefore (8:17 pm)$ 

9. Detectives respond to a call at Dunkin Donuts made by Peter at exactly 5:10 AM. When they arrive Peter is panicked and visually upset. He says she arrived at work around 5 AM to open the store with a fellow worker. Peter has a witness in her father who says he dropped him off at exactly 5 AM. Peter tells the police that when he entered the store his fellow co-worker was already dead. The coroner arrives to take some temperatures and finds that the body is 85°F and the room its in is kept at a constant 68°F. These temperatures are taken at exactly 5:55 AM. Two hours later the coroner takes the second temperature reading. He finds the body to be 74°F and the room to still be 68°F. Should the police consider Peter a suspect?

Precalculus CP 1 Page 5 of 5