## 6.7/6.8 Notes

## Simple Interest

Compound Interest

Continuously Compounded Interest

$$I = \Pr t$$

$$I = Prt$$
  $A = I$   
= Interest Charged  $P = F$ 

$$A = P\left(1 + \frac{r}{n}\right)^{m}$$
P-Principal (8)

$$A = Pe^{rt}$$

t= +ime (years)

P= Principal (#)
r= interest Rate
r= number of times Compounded t= time (years)

1. Find the amount that results from each investment after 10 years: n = 1

## .042

a. \$5,000 invested at 4.2% compounded annually.

b. \$5,000 invested at 4.2% compounded monthly.

$$5000 \left(1 + \frac{.042}{12}\right)^{(12.10)}$$

c. \$5,000 invested at 4.2% compounded daily. = 
$$\frac{365}{5000}$$
 (1 +  $\frac{042}{365}$  (365.10)

d. \$5,000 invested at 4.2% compounded continuously.

2. Find the present value needed to get \$2,000 after 4 years at 5% compounded monthly.

$$A = P(1 + \frac{1}{5})^{n \cdot t}$$

$$2000 = P(1 + \frac{05}{12})^{(12 \cdot 4)}$$

$$2000 = P(1.004167)^{48}$$

$$(1.004167)^{49}$$

$$(1.004167)^{49}$$

$$P = \frac{3}{638.16}$$

3. Find the present value needed to get \$2,000 after 4 years at 5% compounded continuously.

4. Austin will be buying a used car for \$12,000 in 3 years. How much money should he ask his parents for now so that, if he invests it at 4.5% compounded continuously, he will have enough to buy the car?

$$\frac{12000 = Pe^{(.045.3)}}{12000 = Pe^{(.135)}}$$

$$e^{.135}$$

$$e^{.135}$$

$$e^{.135}$$

$$P = \frac{$^{2}}{10,484.59}$$

5. How many years will it take for an initial investment of \$20,000 to grow to \$50,000? Assume a rate of interest of 6% compounded continuously.

$$\frac{50.000}{20.000} = \frac{20.000}{20.000}$$

$$\frac{5}{1000} = \frac{20.000}{20.000}$$

$$\frac{5}{1000} = \frac{.000}{.000}$$

$$\frac{1000}{1000} = \frac{.000}{.000}$$

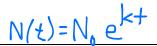
$$\frac{1000}{1000} = \frac{.000}{.000}$$

6. How long will it take for an investment to **double** if it earns 5% compounded continuously?

$$\frac{2}{1} = \frac{1}{1} e^{(.05t)}$$

$$\frac{1}{1} = \frac{1}{1} e^{(.05t)}$$

7. How long will it take for an investment to **triple** if it earns 5% compounded continuously?



, Sir Isaac Newton, co-founder of

$$A(t) = A_0 e^{kt}$$

A0=initial Amount of Population k=Growth Rate (positive Value)

Newton's Law of Cooling

$$u(t) = T + (u_0 - T)e^{kt}$$

u(t)=Temp. after tw:

T= Constant Temp.

k=decay rate (negative t= time

heated object

8. The size N of an ant population at time t (in days) obeys the function:  $N(t) = 800e^{0.034t}$ 

a. Determine the number of ants at t = 0.

t=time (must be specified

c. What is the population after 15 days?

1332 ants When will the ant population triple?

$$\frac{\ln 3}{.034} = \frac{.034}{.034}$$

9. The population of Portland, Oregon follows the exponential law.

a. If N is the population of the city and t is the time in years, express N as a function of t.

c. What will the population be in 2020?

b. What is the growth rate of the ants population?

d. When will the ant population reach 2,000?

$$\frac{2,000}{800} = \frac{800}{800}$$

$$\frac{5}{100} = \frac{1}{100}$$

b. From the years 2000 to 2010, the population of Portland increased from 529,000 to 584,000, respectively. Write an equation assuming uninhibited growth.

equation assuming uninhibited growth.

$$N(\xi) = 529,000 e^{-100}$$
 $584,000 = 529,000 e^{-100}$ 

b. When will its temperature be 50° C?

10. An object is heated to 100° C and is then allowed to cool in a room whose air temperature is 30° C.

a. If the temperature of the object is 80° C after 5 minutes, write an equation using Newton's Law of Cooling.

$$80 = 30 + (100 - 30)$$

$$80 = 80 + (70)^{51}$$

$$U(t) = 30 + (70)^{(\frac{109_{70}}{5})} \cdot t$$
or
$$U(t) = 30 + (70)^{-18416} t$$

$$u(t) = 30 + (70)^{.18416} t$$

$$\frac{50 = 30 + (70)(\frac{10970}{3} \cdot t)}{20 = 70^{\frac{18416}{5}}}$$

$$\frac{10970}{18416} = \frac{18416}{18476}$$