Warm up

1) Julie takes out a loan for a car. It is a $22,000 loan at 3% interest paid monthly that she hopes to pay off in 3 years. What will her payments need to be? (present value)

2) Shane has a truck worth $8,480. If it depreciates continuously by 4%, what will the car be worth in 6 years?

Present

$$= P \left[\frac{1 - \left(1 + \dfrac{r}{n}\right)^{-nt}}{\left(\dfrac{r}{n}\right)} \right]$$

$$22000 = P \left[\frac{1 - \left(1 + \dfrac{0.03}{12}\right)^{-12 \cdot 3}}{\dfrac{0.03}{12}} \right]$$

$639.79

2) Shane has a truck worth $8,480. If it depreciates <u>continuously</u> by 4%, what will the car be worth in 6 years?

$$A = Pe^{-rt}$$

$$A = 8480\, e^{-0.04 \cdot 6}$$

$$\boxed{\$6670.60}$$

3) You are investing $15,000 in to the bank with an annual interest rate of 4 ¾ %. Find the amount of each:

a. Compounded quarterly for 8 years

$21,885.22

b. Compounded semiannually for 6 years

$19,880.08

a. Compounded continuously for 9 years

$23,001.29

4) Mr. Hinson is planning to buy the "BIG" house in Farmwood for $750,000. He plans to take out a 30 year mortgage with an interest rate of 8 ½ %.

a. What will be the monthly payments

$5,766.85

b. How much money will he have paid the mortgage company for the house in 30 years?

$2,076,066

$$\underline{} \cdot 12 \cdot 30$$

c. How much interest will he have paid over the life of the loan?

$1,326,066

Money #2

In exercise 1 – 5, find the value of the investment for each initial amount invested at the given rate, after the stated elapsed time.

$$\Rightarrow n = 1$$

1. $ 700, 7 % compounded annually, 5 years

$$y = A(1+r)^t$$ **$981.79**

2. $ 7000, 11 % compounded continuously, 15 years

$$A = Pe^{rt}$$ **$36,448.86**

3. $ 5000, 8 % compounded quarterly, 5 years

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$ **$7,429.74**

4. $ 20,000, 7.5 % compounded monthly, 8 years

$36,374.39

5. $ 8,000, 8.3 % compounded daily, 4 years

$11,149.60

QUIZ

Growth -- $A = P(1 + r)^t$

Decay -- $A = P(1 - r)^t$

Compound -- $A = P(1 + \dfrac{r}{n})^{nt}$

Continuous -- $A = Pe^{rt}$

Unit 8: Exponentials

Present and Future Value and Review

d all of accumulated interest. The formula for the future value is $F_n = P\left[\dfrac{(1+i)^n - 1}{i}\right]$,

re i is the interest fate for the period. $(i = \dfrac{r}{n}, n = \underline{nt})$

quarter ↑

a. When Connie Hockman began her first job at the age of 22, she started saving for her retirement. Each ~~year~~ she places $4000 in an account that will earn an average 4.75% annual interest until she retires at 65. How much will be in the account when she retires?

$$F_v = 1000\left[\dfrac{\left(1 + \dfrac{0.0475}{4}\right)^{4\cdot 43} - 1}{\dfrac{0.0475}{4}}\right]$$ $\boxed{\$557{,}275.72}$

b. If Ms. Hockman had invested in an account that earns an average of 5.25% annual interest, how much more would her account be worth?

$$F_v = 1000\left[\dfrac{\left(1 + \dfrac{0.0525}{4}\right)^{4\cdot 43} - 1}{\dfrac{0.0525}{4}}\right]$$ $\$641{,}508.33$

$\boxed{\$84{,}232.61}$

2) Amanda is opening an IRA account. She plans to put $150 in the account (
month for 30 years. She hopes to earn an average APR of 4 ½ % over 30 yea

    a.   How much will her account be worth in 30 years?

$$\$113,907.92$$

    b.   How much of (a) has she put into the account?

$$150 \cdot 12 \cdot 30 = \quad \$54,000$$

    c.   How much interest will she have earned?

$$\$59,907.92$$

$$F_v = 150 \left[\frac{\left(1 + \frac{0.045}{12}\right)^{12 \cdot 30} - 1}{\frac{0.045}{12}} \right]$$

Quiz Review

1. Avery's population is steadily declining at 6% per year. If there are 125,000
people now, what is the estimated population in 5 years?
    a. Exponential Growth   Substitution: Answer:
    (b.)Exponential Decay
    c. Compound Interest $y = 125000(1 - 0.06)^5$
    d. Continuous Interest 91738

2. Ben invests $4000 in a firm which advertises 8% returns compounded quarter
What should his investment be worth in 12 years?
    a. Exponential Growth   Substitution: Answer:
    b. Exponential Decay
    (c.)Compound Interest $A = 4000\left(1 + \frac{0.08}{4}\right)^{4 \cdot 12}$
    d. Continuous Interest $\$10348.2$

Quiz Review

3. $2000 is deposited in an account that pays 4% annual interest, compounded continuously. What is the balance in five years?
   a. Exponential Growth
   b. Exponential Decay
   c. Compound Interest
   (d.) Continuous Interest

   Substitution:

   $$A = 2000 e^{0.04 \cdot 5}$$

   Answer:

   $2442.8

4. The ant population in a park is increasing by 2% each year. If there are 1000 ants today, how many are expected in 7 years?
   (a.) Exponential Growth
   b. Exponential Decay
   c. Compound Interest
   d. Continuous Interest

   Substitution:

   $$y = 1000(1 + 0.02)^7$$

   Answer:

   1148 or
   1149

Quiz Review

5. Is $A = 4(0.88)^t$ a model for exponential growth or (decay)? How do you know

   < 1

6. Graham bought a car for $25,000 dollars 5 years ago. It is now worth $18,50 What is the rate of decay for the value of his car? What will it be worth in 5 mo years?

Review Time

Thorium – 234 has a half-life of 25 days, if you start with 256000 grams of Thorium-234, how much will remain after 175 days?

A $256000 home depreciates continuously at 8.5%, how much will it be worth in 12 years?

Brennan has $1000 in the bank, the account compounds monthly at a rate of 8%. He has had the account for 7 years. How much money did he start with in the account (no deposits or withdrawals were made)?

Brad has $1000 in the bank, the account compounds continuously at a rate of 8%. He has had the account for 7 years. How much money did he start with in the account (no deposits or withdrawals were made).

Jason wants to buy a bike. He decides to invest $4000 in the bank to save for it. He puts the money in an account bearing 6% compounded quarterly. How much will be in the account in three years?

Jarod wants to buy a bike. He decides to invest $4000 in the bank to save for it. He puts the money in an account bearing 7.5% compounded continuously. How much will be in the account in three years?
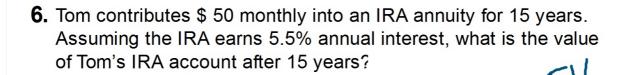
Shawn is taking out a $55,000 loan for college. A bank offers him 4% interest paid monthly for 18 years. What would his monthly payment be?

Shawna's parents decided to save money in a college fund for her when she was born. They deposited $225 each month at 4% interest. How much will be in the account when Shawna turns 18?

Independent Practice

$$$ Money $$$

5. $ 8,000, 8.3 % compounded daily, 4 years

▮▮▮▮▮

6. Tom contributes $ 50 monthly into an IRA annuity for 15 years. Assuming the IRA earns 5.5% annual interest, what is the value of Tom's IRA account after 15 years?

▮▮▮▮▮ $\underline{FV}$

7. Mary contributes to a retirement annuity in which she earns 8.5 % annual interest compounded quarterly. If she wants to accumulate $125,000 by the end of 18 years, how much should she invest each quarter?

▮▮▮▮▮ $\underline{FV}$

⑧ Exp Growth

▮▮▮▮▮
▮▮▮▮▮

$$4 = 256(1-r)^3$$

$$\frac{1}{64} = (1-r)^3$$

$$0.25 = 1-r$$

$$-0.75 = -r \qquad r = 0.75$$