Name

3.1 Present and Future Annuity Values

<u>Annuity</u>: a fixed sum of money paid to someone/bank each year.

- <u>Examples</u>: Retirement Plans, Mortgage Loans, Student Loans, and Car Payments
- Investment/Borrowing Terms: IRA (Individual Retirement Account): 401K, 403B; Mortgage Loan

Types of Annuities:

- <u>Present Value</u>: You are borrowing money now and paying it back over time later.
- <u>Future Value</u>: You are putting money away now and saving it for a later use.

Present Value:
$$P_n = P\left[\frac{1 - (1+i)^{-n}}{i}\right]$$

 P_n = present value of money loaned out

P = future payments amount (fixed over life of loan) i = yearly interest rate divided by number of payments per year

n = number of payments over the life of the loan

- 1. Jeremy purchased a house for \$157,000. He paid an 18% down payment. He gets a 25 year mortgage with an interest rate of 8.9%.
 - a. How much was his down payment?
 - b. How much of the house is financed?
 - c. What is his monthly payment for principal and interest?
 - d. How much will the house cost him in total?
 - e. How much will he pay in total interest over the life of the loan?
- 2. A monthly mortgage payment consists of an amount paid towards the principal (loan balance) and the interest on the loan. It may also contain an amount for the property taxes (school, county, municipality) that the mortgage holder will pay from an escrow (A financial document held by a third party on behalf of the other two parties in a transaction) and an amount for insurance that protects the mortgage holder in case of default on the loan. When she purchased her house in 2011, Ms. Gulkis took out a 30-year mortgage for \$230,000 with a fixed interest rate of 6.375%.
 - a. What will be the monthly payment for the principal and interest?
 - b. After 30 years, how much money will Ms. Gulkis have paid to her mortgage lender?
 - c. How much interest did she end up paying her mortgage lender?

Future Value:
$$F_n = P\left[\frac{(1+i)^n - 1}{i}\right]$$

 F_n = future value of money in your account

P = amount contributed to the annuity each period (fixed)

i = yearly interest rate divided bynumber of payments per year

n = number of contributions over the life of the annuity

3. Jim opened an IRA. He plans to contribute \$1500 per year for a total of 38 years. He hopes to earn an average annual percentage rate (ie: APR or interest rate) of 2.9% over the 38 years.

- b. How much will the IRA account be worth after 38 years?
- c. How much interest will Jim earn?
- 4. When Ms. Konnick started her first job after she finished college, she opened an individual retirement account (IRA). She contributes \$4,000 per year, and plans to continue doing so until she reaches the age of 62 (this will be 40 years of investing!). Based on stock market averages, she expects to earn an APR of 8% over the 40-year period.
 - a. If Ms. Konnick contributes to her IRA as she plans, how much money will her account be worth when she is 62 years old?

- b. How much money did Ms. Konnick actually contribute to her IRA over the 40 year period?
- c. How much interest did she earn over the 40 years?

For annuities project:	If Taxable Income is	The Tax Is
	Not over \$9,075	10% of the taxable income
	Over \$9,075 but not over \$36,900	\$907.50 + 15% of the amount over \$9,075
	Over \$36,900 but not over \$89,350	\$5,081.25 + 25% of the amount over \$36,900
	Over \$89,350 but not over \$186,350	\$18,193.75 + 28% of the amount over \$89,350
	Over \$186,350 but not over \$405,100	\$45,353.75 + 33% of the amount over \$186,350
	Over \$405,100 but not over \$406,750	\$117,541.25 + 35% of the amount over \$405,100
	Over \$406,750	\$118,188.75 + 39.6% of the amount over \$406,750

Given your federal taxable income, determine your amount of yearly federal tax.

5. \$35,000

6. \$52,540

a. How much will Jim contribute over the 38 years?

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Present Value:
$$P_n = P\left[\frac{1 - (1 + i)^{-n}}{i}\right]$$

- P_n = present value of money loaned out P = future payments amount (fixed over life of loan)
- i = yearly interest rate divided by number of payments per year
- n = number of payments over life of the loan
- 1. Congratulations: You are about to purchase your first home! In the process, you are deciding upon the type of mortgage to get and you have the following options for mortgage structures. You plan on purchasing the house for \$275,000 with a 10% down payment. Complete the various mortgage structures to see how much it will cost you to purchase your home for a 15, 20, and 30 year mortgage. Show work on a separate sheet of paper.

Structure 1: Find your monthly loan payment (p) for paying off your house in <u>30 years</u> at a fixed interest rate of 4.250% (.0425)

 $P_n =$ _____

- *i* = _____
- *n* = _____

 $Monthly \ loan \ payment = \ p = ___$

- What is the total amount that you paid for your house in the end?
- What is the total amount of interest that you paid during the life of the loan?

Structure 2: Find your monthly loan payment (p) for paying off your house in 20 years at a fixed interest rate of 4.125% (.04125)

 $P_n =$ _____

i = _____

n = _____

 $Monthly \ loan \ payment = \ p = _$

- What is the total amount that you paid for your house in the end? ______
- What is the total amount of interest that you paid during the life of the loan?

Structure 3: Find your monthly loan payment (p) for paying off your house in <u>15 years</u> at a fixed interest rate of 3.375% (.03375)

 $P_n = _$

- *i* = _____
- *n* = _____

 $Monthly \ loan \ payment = \ p = _$

What is the total amount that you paid for your house in the end?

What is the total amount of interest that you paid during the life of the loan?

Future Value:

F - P	$\left[\frac{\left(1+i\right)^{n}-1}{\right]}$
$\Gamma_n - \Gamma$	i

 F_n = future value of money in your account P = amount contributed to annuity each period (fixed) i = yearly interest rate divided by number of payments per year n = number of contributions over the life of annuity

- 2. After seeing your math homework, your parents decide to put your pre-calculus skills to the test. Your mom and dad have opened an IRA and plan to contribute \$3500 a year for a total of 20 years. Based on stock market averages, they expect to earn an APR of 9% over the 20-year period.
 - a. If your parents contribute to their IRA as they plans, how much money will their account be worth after 20 years?
 - b. How much money did your parents actually contribute to her IRA over the 20 year period?
 - c. How much interest is earned over the 20 years?
- 3. Jeremy opened an IRA. He plans to contribute \$3000 per year for a total of 35 years. He hopes to earn an average annual percentage rate (i.e. APR or interest rate) of 4.7% over the 35 years.
 - a. How much will Jeremy contribute over the 35 years?
 - b. How much will the IRA account be worth after 35 years?
 - c. How much interest will Jeremy earn?