

- 1) (5 points) If you deposited \$15,000 at a simple interest rate of 1.5%, how much would you have after 20 years and how much interest would be earned? Be sure to label your answers.

Simple  
interest

$$A = 15000(1 + 0.015 \cdot 20)$$

$$= \$19,500 \text{ total}$$

$$I = 19500 - 15000 = \$4,500$$

- 2) (5 points) If you deposited \$15,000 at an annual interest rate of 1.5% compounded monthly, how much would you have after 20 years and how much interest would be earned? Be sure to label your answers.

Compound  
Interest

$$A = 15000 \left(1 + \frac{0.015}{12}\right)^{12 \cdot 20}$$

$$= \$20,244.09 \text{ total}$$

$$I = 20,244.09 - 15000 = \$5,244.09$$

- 3) (5 points) How much should be invested now so that in 15 years there will be \$8,300 in an account that offers a 2.35% annual interest rate compounded quarterly?

Present  
value

$$P = 8300 \left(1 + \frac{0.0235}{4}\right)^{-4 \cdot 15}$$

$$= \$5,840.33$$

- 4) (5 points) Which is a better way to invest? Option A: 6.3% compounded semi-annually or Option B: 6.25% compounded monthly? Write answer as a percent rounded to two decimal places.

APY

$$\frac{A}{APY} = \left(1 + \frac{0.063}{2}\right)^2 - 1$$

$$= 6.40\%$$

$$\frac{B}{APY} = \left(1 + \frac{0.0625}{12}\right)^{12} - 1$$

$$= 6.43\%$$

→ better!

20

5) (6 points each) Igor borrowed \$215,000 for a home on a 30-year loan that carried a 6.35% annual interest rate compounded monthly. After 10 years, he was able to refinance down to a 15-year loan that carried a 2.93% annual interest rate compounded monthly.

a) Determine the monthly payment for the beginning 30-year loan:

Amort

$$PMT = \frac{215000 \left( \frac{0.0635}{12} \right)}{\left( 1 - \left( 1 + \frac{0.0635}{12} \right)^{-12 \cdot 30} \right)}$$

$$= \boxed{\$1337.81}$$

b) How much was left on the balance after paying for 10 years?

Amort. owed  
on Loan

$$215000 \left( 1 + \frac{0.0635}{12} \right)^{12 \cdot 10} - \frac{1337.81 \left( \left( 1 + \frac{0.0635}{12} \right)^{12 \cdot 10} - 1 \right)}{\left( \frac{0.0635}{12} \right)}$$

$$\approx \boxed{\$181,577.08}$$

c) Determine the monthly payment for the new 15-year loan:

Amort

$$PMT = \frac{181577.08 \left( \frac{0.0293}{12} \right)}{\left( 1 - \left( 1 + \frac{0.0293}{12} \right)^{-12 \cdot 15} \right)}$$

$$= \boxed{\$1247.83}$$

d) How much money did Igor save by refinancing his mortgage?

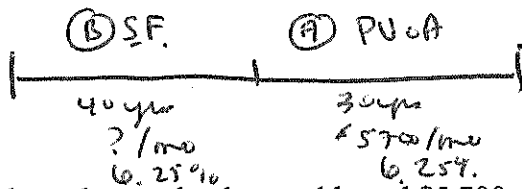
$$1337.81 \cdot 12 \cdot 20 - 1247.83 \cdot 12 \cdot 15$$

$$= \boxed{\$96,465}$$

6) (4 points) Fill in the chart with the appropriate **name** of the formula. Assume that this chart is used for those formulas related to multiple deposits/payments:

	Working Years	Retirement Years
Know the Payment	€	¥
Do Not Know the Payment	\$ <sub>mouse</sub>	¢

*[Handwritten signature]*



7) (6 points each) Schmidt works out that he would need \$5,700 a month during his retired years. He is currently 25 years old and plans to work until his is 65. He assumes that he would need to make withdraws for 30 years past his retirement and that he's in a 20% tax bracket. Assuming he finds an account that will offer him a 6.25% annual interest rate compounded monthly for the entire duration of the account...

a) How much should he have in his account at retirement?

$$PV = \frac{5700 \left(1 - \left(1 + \frac{0.0625}{12}\right)^{-12 \cdot 30}\right)}{\left(\frac{0.0625}{12}\right)}$$

$$= \$925,749.68 \text{ After taxes}$$

$$0.80x = 925,749.68$$

$$\Rightarrow x = \boxed{1,157,187.10} \text{ before tax}$$

b) How much should he deposit monthly during his working years to ensure he meets his goal?

$$PMT = \frac{1,157,187.10 \left(\frac{0.0625}{12}\right)}{\left(\left(1 + \frac{0.0625}{12}\right)^{12 \cdot 40} - 1\right)}$$

$$= \boxed{\$542.79}$$

8) Balthier is 30 years old and is working as a local sky pirate. He is able to deposit \$525 a month into a Pirate Bank 401-k which offers a 7.25% annual interest rate. He does this for 30 years. After that time, he will retire. He wishes, over the next 25 years, to take out equal withdraws until the account is emptied. Assume the interest rate is the same after retirement.

a) (12 points) What are the equal withdraws he is able to take out?

$$FV = \frac{525 \left(\left(1 + \frac{0.0725}{12}\right)^{12 \cdot 30} - 1\right)}{\left(\frac{0.0725}{12}\right)}$$

$$= \$672,993.98$$

$$PMT = \frac{672,993.98 \left(\frac{0.0725}{12}\right)}{\left(1 - \left(1 + \frac{0.0725}{12}\right)^{-12 \cdot 25}\right)} = \boxed{\$4864.45}$$

b) (2 points) How much did he deposit before retirement?

$$\$525 \cdot 12 \cdot 30$$

$$= \boxed{\$189,000}$$

c) (2 points) How much did he withdraw after retirement?

$$\$4864.45 \cdot 12 \cdot 25$$

$$= \boxed{\$1,459,335.00}$$

d) (2 points) How much interest did he earn overall?

$$1,459,335 - 189,000$$

$$= \boxed{\$1,270,335}$$

9) (3 points) What is the **major theoretical** distinction between Compound Interest and Future Value of an Annuity?

One gives out pennies on Halloween 🤪

33

$$DP: 0.25 \cdot 170,000 = \$42,500$$

$$\text{Balance: } 170,000 - 42,500 = 127,500$$

10) Hope takes finds a home for \$170,000. He plans to put down 25% and finance the rest at a 3.15% annual interest rate for 30 years. He determines his monthly mortgage payment to be \$547.91.

a) (6 points) Chart the payment breakdown for the first two months of Hope's home. Be sure to show all necessary work.

Interest	Principal	Balance
$I = 127500 \cdot (0.0315) \left(\frac{1}{12}\right)$ 334.69	547.91 - 334.69 213.22	127500 - 213.22 127,286.78
$I = 127286.78 \cdot (0.0315) \left(\frac{1}{12}\right)$ 334.13	547.91 - 334.13 213.78	127286.78 - 213.78 127073.00

b) (3 points) How much total interest did Hope pay in interest for his home?

$$547.91 \cdot 12 \cdot 30 - 127500 =$$

$$= \$69,747.60$$

11) Bella Goth goes furniture shopping several times during the month of October. Her Myshoono credit card has a \$0 balance as of October 1. Assume that the cycle ends on the first of each month.

a) (7 points) Based on the purchases below, fill in the last column of the table and determine the average daily balance for the account.

Day of Purchase	Item Purchased	Purchase Price	Daily Balance
October 1	Fyre Dryer	\$525.00	525
October 12	Elixir of Life	\$249.00	774
October 18	Zip Zap Microwave	\$189.00	963
October 22	Rubadubdub Rug	\$79.00	1042

$$\frac{11 \cdot 525 + 6 \cdot 774 + 4 \cdot 963 + 10 \cdot 1042}{31} \approx$$

$$\approx \$796.48$$

b) (3 points) Assuming there is a 14.25% annual finance charge on the card and that Bella made no payment on the card, what will be the finance charge for the month of October? Use the  $I = Prt$  formula where  $t$  is the number of days in cycle divided by 365.

$$I = 796.48 \cdot (0.1425) \left(\frac{31}{365}\right) = \$9.64$$

19