

- 1) (5 points) If you deposited \$6,500 at a simple interest rate of 2.3%, how much would you have after 10 years and how much interest would be earned? Be sure to label your answers.

Simple  
interest

$$A = 6500(1 + 0.023 \cdot 10)$$

$$= \boxed{\$7995 \text{ total}}$$

$$\text{Interest } 7995 - 6500 = \boxed{\$1495}$$

- 2) (5 points) You deposit \$2,700 into the account as a lump sum. The account carries a 1.05% interest rate compounded **quarterly**. How much money will be in the account after 20 years and how much interest did he earn?

Compound  
interest

$$A = 2700 \left(1 + \frac{0.0105}{4}\right)^{4 \cdot 20} = \underline{\underline{\$3330.01 \text{ total}}}$$

$$\text{Interest} : 3330.01 - 2700 = \underline{\underline{\$630.01}}$$

- 3) (5 points) How much should be invested now so that in 10 years there will be \$2,500 in an account that offers a 1.35% annual interest rate compounded **daily**? *Hint: Use 365 for n.*

Present  
value

$$P = 2500 \left(1 + \frac{0.0135}{365}\right)^{-365 \cdot 10}$$

$$= \boxed{\$2184.30}$$

- 4) (5 points) Which is a better way to invest? Option A: 7.2% compounded semi-annually or Option B: 6.95% compounded monthly? **Write answer as a percent rounded to two decimal places.**

A

B

$$APY = \left(1 + \frac{0.072}{2}\right)^2 - 1$$

$$= 7.33\%$$

$$APY = \left(1 + \frac{0.0695}{12}\right)^{12} - 1$$

$$= 7.18\%$$

A is better

20

5) (6 points each) Gustavo borrowed \$215,000 for a home on a 30-year loan that carried a 7.25% 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

$$PMT = \frac{215000 \left( \frac{0.0725}{12} \right)}{\left( 1 - \left( 1 + \frac{0.0725}{12} \right)^{-420} \right)}$$

$$= \underline{\$1466.68}$$

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

Amount Owed on a Loan

$$215000 \left( 1 + \frac{0.0725}{12} \right)^{120}$$

$$- \frac{1466.68 \left( \left( 1 + \frac{0.0725}{12} \right)^{120} - 1 \right)}{\left( \frac{0.0725}{12} \right)}$$

$$= \underline{\$185,567.08}$$

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

Amort

$$PMT = \frac{185,567.08 \left( \frac{0.0293}{12} \right)}{\left( 1 - \left( 1 + \frac{0.0293}{12} \right)^{-180} \right)}$$

$$= \underline{\$1275.25}$$

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

remains you

$$1466.68 \cdot 12 \cdot 20$$

$$- 1275.25 \cdot 12 \cdot 15 =$$

$$\underline{\underline{\$122,458.20}}$$

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

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

2,250,000

42500 down

20,000

42,500

127,500

Interest	Principal	Balance
$I = P \cdot r = 127500 \left( 0.0315 \right) \left( \frac{1}{12} \right)$ $= \underline{\$334.69}$	$\$547.91 - 334.69$ $= \underline{\$213.22}$	$\$127500 - 213.22$ $= \underline{\$127,286.78}$
$I = 127286.78 \left( 0.0315 \right) \left( \frac{1}{12} \right)$ $= \underline{\$334.12}$	$\$547.91 - 334.12$ $= \underline{\$213.79}$	$\$127,286.78 - 213.79$ $= \underline{\$127,072.99}$

b) (3 points) How much total interest did she pay in interest for her home? Hint: use the fact that the payment is \$547.91 per month for 30 years.

$$\underline{\$547.91 \cdot 12 \cdot 30 - 127,500 = \$69,747.60}$$

33

Work	Retire
\$ ?/mo	\$ 5500/mo
35 yrs	30 yrs
7.5%	7.5%

7) (6 points each) Nicole works out that she would need \$5,500 a month during her retired years. She is currently 25 years old and plans to work until she is 60. She assumes that she would need to make withdraws for 30 years past her retirement and that she's in a 25% tax bracket. Assuming she finds an account that will offer her a 7.5% annual interest rate compounded monthly for the entire duration of the account...

a) How much should she have in her account at retirement?

PV of A

$$PV = \frac{5500(1 - (1 + \frac{0.075}{12})^{-12 \cdot 30})}{(\frac{0.075}{12})}$$

$$= 786,596.95 \text{ After tax}$$

b) How much should she deposit monthly during her working years to ensure she meets her goal? *single find*

$$PMT = \frac{1,048,795.93 (\frac{0.075}{12})}{((1 + \frac{0.075}{12})^{12 \cdot 35} - 1)}$$

$$= \boxed{\$516.45}$$

Before taxes  $\frac{786,596.95}{0.75} \rightarrow \boxed{1,048,795.93}$   
*keep 75%*

8) Balthier is 30 years old and is working as a local sky pirate. He is able to deposit \$650 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? *Hint: You need two formulas.*

FV

$$FV = \frac{650((1 + \frac{0.0725}{12})^{12 \cdot 30} - 1)}{(\frac{0.0725}{12})}$$

$$= 833,230.64$$

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

$$650 \cdot 12 \cdot 30$$

$$= \underline{\underline{\$234,000}}$$

interest

$$PMT = \frac{833,230.64 (\frac{0.0725}{12})}{(1 - (1 + \frac{0.0725}{12})^{-12 \cdot 25})}$$

$$= \underline{\underline{\$6022.65}}$$

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

$$6022.65 \cdot 12 \cdot 25$$

$$= \underline{\underline{\$1,806,795}}$$

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

$$\$1,806,795 - 234,000$$

$$= \boxed{\$1,572,795}$$

Work	Retire
\$ 650/mo	?/mo
7.25%	7.25%
30 yrs	25 yrs

$\frac{4}{30}$

9) (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	<i>in</i>	<i>notes</i>
Do Not Know the Payment		

10) (3 points) What is the **major theoretical** distinction between Compound Interest and Future Value of an Annuity?

*also in notes*

11) Mike goes board game shopping several times during the month of April. His PlasticMatic credit card has a \$0 balance as of April 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
April 1	Mythwind	\$319	319
April 12	Star Trek 4X	\$249	568
April 16	River Valley	\$85	653
April 18	Payment	-\$500	153
April 22	Casadito	\$79	232

11 G  
4 G  
2 G  
4 G  
9 G  
3 =

$$\frac{11 \cdot 319 + 4 \cdot 568 + 2 \cdot 653 + 4 \cdot 153 + 9 \cdot 232}{30} \approx \underline{\underline{326.23}}$$

b) (3 points) Assuming there is a 16.15% annual finance charge on the card, what will be the finance charge for the month of April? *Hint: Use the  $I = Prt$  formula where  $t$  is the number of days in cycle divided by 365.*

$$I = 326.23 \cdot \frac{0.1615}{365} \cdot \frac{30}{365} = \underline{\underline{4.33}}$$

17