

- 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

$$I = 15000(0.015)(20) = \boxed{\$4500 \rightarrow \text{interest only}}$$

$$A = 15000 + 4500 = \boxed{\$19500 \rightarrow \text{total amount}}$$

- 2) (5 points) Setting up a 529-plan for his son, Graziano puts away \$5,300 into the account as a lump sum. The account carries a 3.55% interest rate compounded monthly. How much money will be in the account after 18 years and how much interest did he earn?

Compound
interest

$$A = 5300 \left(1 + \frac{0.0355}{12}\right)^{12 \cdot 18}$$

$$= \boxed{\$10,031.83 \rightarrow \text{total}}$$

$$10,031.83 - 5300 = \boxed{\$4731.83 \rightarrow \text{interest earned}}$$

- 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 quarterly?

Present
value

$$P = 2500 \left(1 + \frac{0.0135}{4}\right)^{-4 \cdot 10}$$

$$= \boxed{\$2184.79}$$

- 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:

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

$$= \boxed{7.33\%}$$

Option A better!

B:

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

$$= 7.18\%$$

APY

5) (6 points each) Clive 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:

Amortize 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?

$215000 \left(1 + \frac{0.0635}{12} \right)^{12 \cdot 10}$ Amount owed on loan.
 $- \frac{1337.81 \left(\left(1 + \frac{0.0635}{12} \right)^{12 \cdot 10} - 1 \right)}{\left(\frac{0.0635}{12} \right)}$
 = $\boxed{\$181577.08}$

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

Amount 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 Clive save by refinancing his mortgage?

$1337.81 \cdot 12 \cdot 20$
 $- 1247.83 \cdot 12 \cdot 15$
 = $\boxed{\$96,465}$

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.

$170000 - 0.25 \cdot 170000 = 127,500 \rightarrow P \text{ at start}$

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

Interest	Principal	Balance
$I = 127,500 \left(0.0315 \left(\frac{1}{12} \right) \right)$ $= \$334.69$	$547.91 - 334.69$ $= \$213.22$	$127,500 - 213.22$ $= \$127,286.78$
$I = 127,286.78 \left(0.0315 \left(\frac{1}{12} \right) \right)$ $= \$334.13$	$547.91 - 334.13$ $= \$213.78$	$127,286.78 - 213.78$ $= \$127,073$

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.

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

Work	retire
\$2,100/mo	\$6,000/mo
35 yrs	30 yrs
7.5%	7.5%

→ tax 20%

7) (6 points each) Schmidt works out that he would need \$6,000 a month during his retired years. He is currently 25 years old and plans to work until his is 60. 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 7.5% annual interest rate compounded monthly for the entire duration of the account...

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

$$PV = \frac{6000 \left(1 - \left(1 + \frac{0.075}{12}\right)^{-12 \cdot 30}\right)}{\left(\frac{0.075}{12}\right)}$$

PV_{0A}

$$= \$858,105.76 \rightarrow \text{after tax}$$

before tax

$$\frac{858105.76}{0.80} = \boxed{\$1,072,632.20}$$

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

$$PMT = \frac{1072632.20 \left(\frac{0.075}{12}\right)}{\left(\left(1 + \frac{0.075}{12}\right)^{12 \cdot 35} - 1\right)} \quad \text{Sinking fund}$$

$$= \boxed{\$528.19}$$

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

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

$$= \$1,833,230.64$$

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

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

Amount

$$PMT = \frac{1833230.64 \left(\frac{0.0725}{12}\right)}{\left(1 - \left(1 + \frac{0.0725}{12}\right)^{-12 \cdot 25}\right)}$$

$$= \boxed{\$6022.65}$$

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

$$\$6022.65 \cdot 12 \cdot 25$$


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

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

$$1806795 - 234000$$

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

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		
Do Not Know the Payment		

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

One of them puts money in pizza.

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	525
October 12	Elixir of Life	\$249	774
October 16	Payment	-\$350	424
October 18	Zip Zap Microwave	\$189	613
October 22	Rubadubdub Rug	\$79	692

11 C
4 C
2 C
4 C
10 C
31

$$\frac{11 \cdot 525 + 4 \cdot 774 + 2 \cdot 424 + 4 \cdot 613 + 10 \cdot 692}{31}$$

$$= \$615.84$$

b) (3 points) Assuming there is a 14.25% annual finance charge on the card, what will be the finance charge for the month of October? Hint: Use the $I = Prt$ formula where t is the number of days in cycle divided by 365.

$$I = 615.84 (0.1425) \cdot \frac{31}{365} = \$7.45$$

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