

- 1) (6 points) Dario invests \$450 into an account that offers a 1.79% simple annual interest rate for 8 years. How much is in the account after that time and how much interest was earned?

simple interest

$$I = 450(0.0179)(8) = \boxed{64.44} \text{ interest}$$

$$A = 450 + 64.44 = \boxed{514.44} \text{ total}$$

- 2) (6 points) Setting up a 529 plan for his son, Matthew puts away \$8,950 into the account as a lump sum. The account carries a 5.85% interest rate compounded monthly. How much money will be in the account after that time and how much interest did he earn?

compounded interest

missing info.

- 3) (6 points) How much should be invested now so that in 12 years there will be \$7,000 in an account that offers a 2.35% annual interest rate compounded quarterly?

Present value

$$P = 7000 \left(1 + \frac{0.0235}{4}\right)^{-4 \cdot 12}$$

$$= \boxed{5284.27}$$

- 4) (6 points) Which is a better way to invest? Option A: 5.2% compounded semi-annually or Option B: 5.1% compounded monthly? Write answer as a percent rounded to three decimal places.

APY

$\frac{A}{\left(1 + \frac{0.052}{2}\right)^2 - 1}$	$\frac{B}{\left(1 + \frac{0.051}{12}\right)^{12} - 1}$
5.268%	5.221%
$\boxed{5.268\%}$ <p style="text-align: center;">↑ better!</p>	

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5) (6 points each) Sabrina borrowed \$123,000 for a home on a 30-year loan that carried a 6.75% annual interest rate compounded monthly. After 7 years, she was able to refinance down to a 15-year loan that carried a 3.15% annual interest rate compounded monthly.

- a) Determine the monthly payment for the beginning 30-year loan: b) How much was left on the balance after paying for 7 years? *Amount owed on loan.*

Amount

$$PMT = \frac{123000 \left(\frac{0.0675}{12} \right)}{\left(1 - \left(1 + \frac{0.0675}{12} \right)^{-12 \cdot 30} \right)}$$

$$= \boxed{797.78}$$

$$123000 \left(1 + \frac{0.0675}{12} \right)^{12 \cdot 7} - \frac{797.78 \left(\left(1 + \frac{0.0675}{12} \right)^{12 \cdot 7} - 1 \right)}{\left(\frac{0.0675}{12} \right)}$$

$$= \boxed{111,668.13}$$

- c) Determine the monthly payment for the new 15-year loan: d) How much money did Sabrina save by refinancing her mortgage?

Amount

$$PMT = \frac{111668.13 \left(\frac{0.0315}{12} \right)}{\left(1 - \left(1 + \frac{0.0315}{12} \right)^{-12 \cdot 15} \right)}$$

$$= \boxed{779.24}$$

$$797.78 \cdot 12 \cdot 23$$

$$- 779.24 \cdot 12 \cdot 15$$

$$= \boxed{79,924.08}$$

6) (8 points) Nicole takes out a loan of \$175,000 for a condo. Her loan has a 4.12% annual interest rate compounded monthly for 30 years. Chart the first two months of the loan given the monthly mortgage payment is \$847.63. Be sure to show the numbers that are being multiplied and subtracted. Round to two decimal places as you work:

End of Month	Interest	Principal	Balance
1	$I = PRT = 175000 \left(\frac{0.0412}{12} \right)$ 600.83	$847.63 - 600.83$ 246.80	$175000 - 246.80$ 174,753.20
2	$174753.20 \left(\frac{0.0412}{12} \right)$ 599.99	$847.63 - 599.99$ 247.64	$174753.20 - 247.64$ 174,505.56

7) (6 points each) Schmidt works out that he would need \$5,000 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 withdrawals for 30 years past his retirement and that he's in a 25% tax bracket. Assuming he finds an account that will offer him a 6.25% annual interest rate compounded monthly...

- a) How much should he have in his account at retirement? b) How much should he deposit monthly during his working years to ensure he meets his goal?

PV of A

$$PV = \frac{5000 \left(1 - \left(1 + \frac{0.0625}{12} \right)^{-12 \cdot 30} \right)}{\left(\frac{0.0625}{12} \right)}$$

$$= 812,061.12 \quad \leftarrow \text{after taxes } \checkmark \text{ pre tax}$$

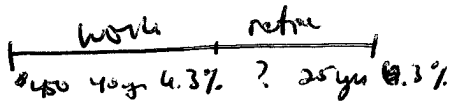
$$0.75x = 812061.12 \Rightarrow \boxed{x = 1,082,748.16}$$

sinking fund

$$PMT = \frac{1082748.16 \left(\frac{0.0625}{12} \right)}{\left(\left(1 + \frac{0.0625}{12} \right)^{12 \cdot 40} - 1 \right)}$$

$$= \boxed{507.88}$$

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8) Isaac, who is 24 years old, starts his career and opens up a 401k where he deposits \$450 every month. He plans to work until he is 64 years old. During retirement, he would like to take out equal payments over the next 25 years. Assuming the account carries a 6.30% annual interest rate compounded monthly for the entire length of the account, determine the following.

11C
7C
4C
9C
FV of Annuity a) (12 points) What are the equal withdrawals he is able to take out?

b) (2 points) How much total did he deposit during his working years?

$$FV = \frac{450 \left(\left(1 + \frac{0.063}{12} \right)^{12 \cdot 40} - 1 \right)}{\left(\frac{0.063}{12} \right)} = 972,594.65$$

$$450 \cdot 12 \cdot 40 = 216,000$$

$$PMT = \frac{972,594.65 \left(\frac{0.063}{12} \right)}{\left(1 - \left(1 + \frac{0.063}{12} \right)^{-n \cdot 25} \right)} = 6446.00$$

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

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

$$6446 \cdot 12 \cdot 25 = 1,933,800$$

$$1,933,800 - 216,000 = 1,717,800$$

9) Mike goes game-shopping several times during the month of October. His Spooky® credit card has a \$0 balance as of October 1.

a) (8 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	Halloween Candy	\$39.00	39
October 12	More Halloween Candy	\$253.00	292
October 19	Costumes for Dogs	\$79.00	371
October 23	Costume for Mike	\$55.00	426

$$\frac{11 \cdot 39 + 7 \cdot 292 + 4 \cdot 371 + 9 \cdot 426}{31} = 251.32$$

b) (3 points) Assuming there is a 14.75% annual finance charge on the card and that Mike 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.

$$I = 251.32 (0.1475) \left(\frac{31}{365} \right) = 3.15$$

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

I ate all the Halloween candy...

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