

- 1) (6 points) Frank invests in the Darko Bank that offers a 2.25% simple interest rate. He invests \$550 at this rate for 8 years. How much is in the account after that time and how much interest was earned?

Simple
interest

$$A = 550 (1 + 0.0225 \cdot 8)$$

$$= \boxed{\$649 \rightarrow \text{total}}$$

$$649 - 550 = \boxed{\$99 \text{ interest}}$$

- 2) (6 points) If \$7500 was deposited into an account that offered a 1.75% annual interest rate compounded monthly for 12 years, how much would be in the account after that time and how much interest was earned? Be sure to label your answers.

Compound
Int

$$A = 7500 \left(1 + \frac{0.0175}{12}\right)^{12 \cdot 12} = \boxed{\$9251.17 \text{ total}}$$

$$9251.17 - 7500 = \boxed{\$1751.17 \text{ interest}}$$

- 3) (6 points) How much should be invested now so that in 10 years there will be \$7,000 in an account that offers a 5.35% annual interest rate compounded quarterly?

Present
value

$$P = 7000 \left(1 + \frac{0.0535}{4}\right)^{-4 \cdot 10}$$

$$= \boxed{\$4114.25}$$

- 4) (6 points) Which is a better way to invest? Option A: 6.2% compounded daily (use 365) or Option B: 6.25% compounded monthly? Write answer as a percent rounded to two decimal places.

APY

$$\text{APY}_A = \left(1 + \frac{0.062}{365}\right)^{365} - 1$$

$$6.40\%$$

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

$$\text{better!} \rightarrow \boxed{6.43\%}$$

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5) (6 points each) Atrus borrowed \$145,000 for a home on a 30-year loan that carried a 6.75% annual interest rate compounded monthly. After 12 years, he was able to refinance down to a 15-year loan that carried a 2.85% 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 12 years?

Amount
$$PMT = \frac{145000 \left(\frac{0.0675}{12} \right)}{\left(1 - \left(1 + \frac{0.0675}{12} \right)^{-12 \cdot 12} \right)}$$

$$= 940.47$$

Amount owed on a loan

$$145000 \left(1 + \frac{0.0675}{12} \right)^{12 \cdot 12} - \frac{940.47 \left(\left(1 + \frac{0.0675}{12} \right)^{12 \cdot 12} - 1 \right)}{\left(\frac{0.0675}{12} \right)}$$

$$= 117,416.20$$

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

Amount
$$PMT = \frac{117416.20 \left(\frac{0.0285}{12} \right)}{\left(1 - \left(1 + \frac{0.0285}{12} \right)^{-12 \cdot 15} \right)}$$

$$= 8802.41$$

$$940.47 \cdot 12 \cdot 18 - 802.41 \cdot 12 \cdot 15 =$$

$$= \$58,707.72$$

6) (8 points) Ruth and Wallace takes out a loan of \$122,000 for a home. Their loan has a 3.75% annual interest rate compounded monthly for 30 years. Chart the first two months of the loan given the monthly mortgage payment is \$565.00. 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	$I = 122000(0.0375)\left(\frac{1}{12}\right)$ 381.25	$565 - 381.25$ 183.75	$122000 - 183.75$ 121,816.25
2	$I = 121816.25(0.0375)\left(\frac{1}{12}\right)$ 380.68	$565 - 380.68$ 184.32	$121816.25 - 184.32$ 121,631.93

7) (6 points each) Schmidt works out that he would need \$4,000 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 withdraws 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_{0A}
$$PV = \frac{4000 \left(1 - \left(1 + \frac{0.0625}{12} \right)^{-12 \cdot 30} \right)}{\left(\frac{0.0625}{12} \right)}$$

$$= 649,648.90 \text{ after taxes}$$

$$0.75x = 649648.90 \Rightarrow x = 866,198.53$$

Sinking fund

$$PMT = \frac{866198.53 \left(\frac{0.0625}{12} \right)}{\left(\left(1 + \frac{0.0625}{12} \right)^{12 \cdot 40} - 1 \right)}$$

$$= 406.30$$

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8) Alexander starts his career and is able to deposit \$525 a month into a Burr 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 withdrawals until the account is emptied. Assume the interest rate is the same after retirement.

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

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

FV
d
PMT

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

$$= \frac{525 \cdot 672,993.98}{0.006041667} = 672,993.98$$

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

$$525 \cdot 12 \cdot 30 = 189,000$$

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

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

$$4864.45 \cdot 12 \cdot 25 = 1,459,335$$

$$1,459,335 - 189,000 = 1,270,335$$

9) Mike goes shopping several times during the month of November. His Chargeme credit card has a \$0 balance as of November 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	Game Purchased	Purchase Price	Daily Balance
November 1	Discounted Halloween Candy	\$659.00	659
November 12	More Candy	\$249.00	908
November 18	Electric Toothbrush	\$49.00	957
November 22	Dentist Appointment	\$779.00	1736

11 C
6 C
4 C
9 C

$$\frac{11 \cdot 659 + 6 \cdot 908 + 4 \cdot 957 + 9 \cdot 1736}{30}$$

$$= 1071.63$$

b) (3 points) Assuming there is a 16.75% 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 November? Use the $I = Prt$ formula where t is the number of days in cycle divided by 365.

$$I = 1071.63 \left(\frac{0.1675}{365} \right) \cdot 30 = 14.75$$

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

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