

- 1) (6 points) Frank invests in the Darko Bank that offers a 3.25% simple interest rate. He invests \$600 at this rate for 8 years. How much is in the account after that time?

simple
interest

$$A = 600(1 + .0325 \cdot 8)$$

$$= \boxed{\$756.00}$$

- 2) (6 points) Jesse found \$4,500 on the side of the road next to a turned-over armored truck. (Everyone in the truck was a-okay). He decided to put the money into a savings account that offered a 1.5% annual interest rate compounded monthly for 4 years. How much money will be in the account after that time? And how much interest did he earn?

Compound
int.

$$A = 4500 \left(1 + \frac{.015}{12} \right)^{12 \cdot 4} = \boxed{\$4778.09}$$

$$\text{Interest} = 4778.09 - 4500 = \boxed{\$278.09}$$

- 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

$$P = 7000 \left(1 + \frac{.0535}{4} \right)^{-4 \cdot 10}$$

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

- 4) (6 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.

Option A

APY

$$APY = \left(1 + \frac{.063}{2} \right)^2 - 1$$

$$6.40\%$$

Option B

$$APY = \left(1 + \frac{.0625}{12} \right)^{12} - 1$$

6.43%

better!

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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 8 years, he was able to refinance down to a 15-year loan that carried a 3.25% 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 8 years?

Amort
$$PMT = \frac{145000 \left(\frac{.0675}{12} \right)}{\left(1 - \left(1 + \frac{.0675}{12} \right)^{-12 \cdot 30} \right)}$$

$$= \boxed{\$940.47}$$

Amount owed on a loan

$$145000 \left(1 + \frac{.0675}{12} \right)^{12 \cdot 8} - \frac{940.47 \left(\left(1 + \frac{.0675}{12} \right)^{12 \cdot 8} - 1 \right)}{\left(\frac{.0675}{12} \right)} = \boxed{\$129,166.05}$$

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

Amort
$$PMT = \frac{129166.05 \left(\frac{.0325}{12} \right)}{\left(1 - \left(1 + \frac{.0325}{12} \right)^{-12 \cdot 15} \right)}$$

$$= \boxed{\$907.61}$$

$$940.47 \cdot 12 \cdot 22 - 907.61 \cdot 12 \cdot 15 = \boxed{\$84,914.28}$$

6) (8 points) Kondor takes out a loan of \$100,000 for a condo. Her loan has a 4.5% annual interest rate compounded monthly for 15 years. Chart the first two months of the loan given the monthly mortgage payment is \$770.00. 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 | $100000(.045)\left(\frac{1}{12}\right)$ 375 | $770 - 375$ 395 | $100000 - 395$ 99,605 |
| 2 | $99605(.045)\left(\frac{1}{12}\right)$ 373.52 | $770 - 373.52$ 396.48 | $99605 - 396.48$ 99,208.52 |

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 of A
$$PV = \frac{4000 \left(1 - \left(1 + \frac{.0625}{12} \right)^{-12 \cdot 30} \right)}{\left(\frac{.0625}{12} \right)}$$

$$= 649,648.90 \leftarrow \text{post tax}$$

Before tax
$$\frac{649648.90}{.75} = \boxed{\$866,198.53}$$

$$PMT = \frac{866198.53 \left(\frac{.0625}{12} \right)}{\left(\left(1 + \frac{.0625}{12} \right)^{12 \cdot 40} - 1 \right)}$$

$$= \boxed{\$406.30}$$

sinking fund

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

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

$$525 \cdot 12 \cdot 30 = \boxed{\$189,000}$$

$$= 672,993.98$$

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

- c) (2 points) How much did he withdraw after retirement? d) (2 points) How much interest did he earn overall?

$$4864.45 \cdot 12 \cdot 25 = \boxed{\$1,459,335}$$

$$1,459,335 - 189,000 = \boxed{\$1,270,335}$$

9) Mike goes game-shopping several times during the month of November. His PlayStation 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 | Uncharted 4 | \$59.00 | 59.00 |
| November 12 | Rock Band 4 Bundle | \$249.00 | 308.00 |
| November 19 | The Talos Principle | \$49.00 | 357.00 |
| November 22 | Battleborn Deluxe | \$79.00 | 436.00 |

11C
7C
3C
9C

$$\frac{11 \cdot 59 + 7 \cdot 308 + 3 \cdot 357 + 9 \cdot 436}{30} = \$260.00$$

- 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.

$$I = 260.00 \left(.1675 \right) \left(\frac{30}{365} \right) = \boxed{\$3.58}$$

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

One of them knows all the names of NKOTB.

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