Math 112 - Test 3

April 23, 2019

Name _____

Score _____

Show all work. Supply explanations when necessary. Partial credit will be awarded for correct work.

1. (5 points) Sofia deposits \$8500 into an account earning simple interest. After 4 years, the account is worth \$10,727. What was Sofia's simple interest rate?

$I = 10727 - 8500$

$= 2227 = (8500)(r)(4).$

$2227 = 34000\,r$

$\frac{2227}{34000} = r \longrightarrow r = 0.0655 = 6.55\%$

2. (5 points) Mohamed bought a new car that sold for \$34,749. To obtain the money he needed, Mohamed got a loan at his credit union that requires him to make monthly payments of \$609.25 for 6 years. How much will he end up paying in interest?

$I = (609.25)(12)(6) - 34749$

$= 43866 - 34749 = \$9117$

3. (5 points) Julia got a new credit card with credit limit of \$13,500. Her interest rate is 12.99% compounded daily. Determine her effective interest rate. Write your final answer in percent form.

$E = \left(1 + 0.1299/365\right)^{365} - 1$

$= 0.138688\ldots$

$\approx 13.87\%$

4. (6 points) Denise bought a Sleep Number mattress for \$1499. The mattress store financed her purchase at 10.99% simple interest for 3 years.

   (a) How much interest will Denise pay?

$$I = (1499)(0.1099)(3)$$
$$= \$494.22$$

   (b) Denise decides to pay the total amount (principal + interest) in 36 equal monthly payments. How much is each payment?

$$\frac{1499 + 494.22}{36} = \$55.37$$

5. (10 points) Amos made a profit of \$72,424 on the sale of some property. He deposits that money, all at one time, into an account earning 6.49% compounded quarterly. Then he forgets all about the account.

   (a) How much money will be in the account after 25 years?

$$A = 72424 * \left(1 + 0.0649/4\right)^{(4*25)}$$
$$= \$362,134.57$$

   (b) How much of the account value is from interest?

$$362134.57 - 72424$$
$$= \$289,710.57$$

6. (9 points) In order to plan for their retirement, a married couple decide to purchase an annuity that earns 8.5% compounded semiannually. They will make semiannual payments of $3200 for 28 years.

(a) How much will the annuity be worth after the 28 years?

$$A = \frac{3200 * \left(\left(1 + 0.085/2\right)^{(2*28)} - 1\right)}{\left(0.085/2\right)} = \$699,204.44$$

(b) After the 28 years, how much of their own money will they have deposited into the annuity?

$$3200 * 2 * 28 = \$179,200$$

(c) How much total interest will be earned?

$$699204.44 - 179200 = \$520,004.44$$

7. (3 points) Briefly explain what an annuity is.

An investment account into which regular periodic payments are deposited (or withdrawn).

8. (6 points) How much would you have to invest now into a savings account earning 2.35% compounded monthly to make it worth $5000 after 5 years?

$$5000 = P * \underbrace{\left(1 + 0.0235/12\right)^{(12*5)}}_{1.124552409\ldots}$$

$$P = \frac{5000}{1.12455\ldots} = \$4446.21$$

9. (6 points) Mike and Jenny purchased new dining room furniture by agreeing to make monthly payments of $39.30 for six years. Their financing arrangement called for an interest rate of 13.99% compounded monthly. How much would the furniture cost if Mike and Jenny paid all at once in cash?

$$P = \frac{39.30 * \left(1 - \left(1 + 0.1399/12\right)^{(-12*6)}\right)}{\left(0.1399/12\right)}$$

$$= \$1907.73$$

10. (25 points) A house sells for \$212,500. You make a 8% down payment and mortgage the remaining amount for 30 years at 3.925% compounded monthly.

(a) How much is the down payment?

8% of \$212,500

0.08 * 212500 → \$17,000

(b) What is the initial loan amount for your mortgage?

212500 - 17000

= \$195,500

(c) What is the monthly payment?

$$R = \frac{195500 * \left(0.03925/12\right)}{\left(1 - \left(1 + 0.03925/12\right)^{(-12*30)}\right)} = \$924.91$$

(d) When the loan is paid off in 30 years, what will be the total interest paid?

924.91 * 12 * 30 - 195500

= \$137,467.60

(e) Compute the first 3 rows of the amortization schedule. Include at least the payment number, interest, amount paid to principal, and the outstanding balance.

Payment #	Payment	Interest	Payment to Principal	Balance
1	924.91	639.45	285.46	195,214.54
2	924.91	638.51	286.40	194,928.14
3	924.91	637.58	287.33	194,640.81

#1
$195500 * (0.03925)\left(\frac{1}{12}\right)$
= 639.45

#2
$195,214.54 * (0.03925)\left(\frac{1}{12}\right)$
= 286.40

#3
$194928.14\ (0.03925)\left(\frac{1}{12}\right)$
= 637.58

Take-Home Problems. Due Monday.

11. (10 points) After winning \$115,000 on a game show, Carmen invests the money, all at once, into an account earning 8.9% compounded quarterly. Use guess and check to determine about how long it will take for the account value to grow to \$250,000.

$$250000 = 115000 * \left(1 + 0.089/4\right)^{(4*t)}$$

$t = 8$ gives \$232,554.99

$t = 9$ gives \$253,953.46

$t = 8.75$ gives \$248,425.98

$t = 8.82$ gives \$249,961.43

JUST A BIT LONGER THAN 8.82 years

12. (10 points) Sabrina and Tim are planning to buy a house. They can afford to make monthly mortgage payments of \$1050. The current interest rate for a 30-year, fixed-rate mortgage is 4% compounded monthly. How much can they borrow?

$$P = \frac{1050 * \left(1 - \left(1 + 0.04/12\right)^{(-12*30)}\right)}{\left(0.04/12\right)}$$

$$= \$219,934.30$$