Homework 4
Math 181: Fall 2015
Due: Friday, October 16th

About this homework assignment:

- If you write your answers on multiple pieces of paper, please staple them together. Remove any “fringe” from notebook paper.

- You are welcome to work with other students on homework, however you must each write up your own solutions in your own words. If you do collaborate with others, include their names on your work.

- Homework is due at the beginning of class. If you are more than 5 minutes late for class on a day that homework is due, you will receive a zero for that assignment.

- For the problems in this assignment:

  1. Write out any formulas you plan to use.
  2. Show what numbers you are substituting into the formula.
  3. Use a calculator to simplify your final answer. (There should be no multiplication, division, or addition symbols in your final answer.)

1. Saving for Retirement. For the purposes of this problem, we will assume you plan to retire at age 65 and you expect to live 30 years after that. After you turn 65, you won’t be adding any money to your retirement account and you will have to live off of the principal and any interest. The account continues to earn interest after you retire.

Suppose you have a retirement account with a nominal annual interest rate of 7%, compounded monthly.

(a) Estimate what you want your yearly income to be after you retire. (There isn’t really a wrong answer to this part. Just pick something that seems like enough to cover your housing, food, travel, presents for grandkids, etc. Don’t worry about inflation.)

(b) Based on your answer to (a), what should your monthly income be after you retire?

(c) What is the periodic interest rate for your retirement account?

(d) How much money do you need to have in your account at age 65 so that you can withdraw the amount from (b) from your retirement account at the end of each month for 30 years without running out of money? (In other words, how much money will you need to save by the time you are 65 so that you can live off of your retirement account until you are 95?)

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(e) If you wait until you are 35 years old to start saving money in your retirement account
   i. what do your monthly payments have to be to reach the amount from (d) by the time you are 65?
   ii. what is the total amount you will have deposited in the account by the time you are 65?
      (This is different from the account total.)
   iii. what is the total amount of interest you will have earned by the time you are 65?

(f) If you wait until you are 25 years old to start saving money in your retirement account
   i. what do your monthly payments have to be to reach the amount from (d) by the time you are 65?
   ii. what is the total amount you will have deposited in the account by the time you are 65?
      (This is different from the account total.)
   iii. what is the total amount of interest you will have earned by the time you are 65?

(g) Based on this problem, is it a better idea to start saving for retirement when you are 35 or when you are 25? Give a financial reason why.

2. **Student Loans.** Suppose you have a student loan of $6,500 with a nominal annual interest rate of 4.3%, compounded monthly. Suppose you don’t have to make payments until you graduate and that you graduate in two years. After you graduate, you must start making payments and you will have 10 years to pay off the loan. However, the loan is still charged interest in the first two years before you graduate, even though you don’t have to make payments.

   (a) Suppose you don’t make any payments while you are in school.
      i. What will be the total owed when you graduate?
      ii. If you take 10 years after that to pay off the loan, what will be your monthly payments? What will be the total amount you pay on the loan?
      iii. If you decide to pay off the loan faster and take only 6 years after you graduate to pay off the loan, what will be your monthly payments? What will be the total amount you pay on the loan?

   (b) Suppose while you are in school you pay the interest charged each month.
      i. How much must you pay each month before you graduate?
      ii. If you take 10 years after you graduate to pay off the loan, what will be your monthly payments? What will be the total amount you pay on the loan?
      iii. If you decide to pay off the loan faster and take only 6 years after you graduate to pay off the loan, what will be your monthly payments? What will be the total amount you pay on the loan?

   (c) Compare your answers in part (a) to your answers in part (b).