Math 1313 Exam 2   Name: _____

Show all of your work to receive full credit.

1. You invest $100 in an account that pays simple interest of 4% annually. How much money will you have at the end of 25 years?

2. A bank offers an account at 7% compounded daily.

   (a) Find the balance in the account after one year if a principal of $400 is invested.

   (b) Find annual percentage yield (APY) of this account.

3. How much must be deposited today into an account, with quarterly compounding and an APR of 3%, in order to have $30,000 in 10 years for a down payment on a house? (Assume no additional deposits are made.)

4. You want to create a college savings fund for your nephew. How much do you need to deposit monthly into an account that offers an APR of 6% in order to accumulate $20,000 in 15 years?

5. You are 18 years old, but already have your retirement plans settled. You want to retire early at age 40, and be able to draw on retirement savings earning $50,000 per year, forever.

   (a) What balance will you need, in order to earn $50,000 annually from interest in an account with an APR of 5%?

   (b) Suppose now you make regular monthly payments into a savings plan, trying to achieve a total balance of $1.5 million upon your retirement. Determine your required monthly payment. (Assume again the APY is 5%.)

6. You have borrowed $100,000 for a period of 30 years at an APR of 5.5%.

   (a) Determine your monthly payment on your loan.

   (b) Determine the total payment over the 30 years of the loan.

7. (a) For each of the following, state whether the growth is linear or exponential (circle your answer).
      The population of Smallville is decreasing at a rate of 250 people per year.   *linear exponential*
      The price of gasoline is increasing at a rate of 23 cents per week.   *linear exponential*
      The value of your home increases at a rate of about 3% annually.   *linear exponential*
      The average ACT score of students nationwide is increasing by 1% per year.   *linear exponential*

   (b) The population of Smallville is decreasing (at a rate of 250 people per year as above) because of few economic opportunities. How much will it decrease by in the next 20 years?

8. Suppose that poaching reduces the population of an endangered animal by 5% per year. Further suppose that when the population of this animal falls below 100, its extinction is inevitable (owing to the lack of reproductive options without severe in-breeding). If the current population of the animal is 5000, estimate when will it face extinction.

9. A country is experiencing hyperinflation, with inflation rates at about 10% every month. If a gallon of milk costs $1 in January, how much will it cost in January of next year?

10. You are a bureaucrat and are falling behind on your work. The word has come down to expect an exponentially increasing amount of paperwork in the next month. Today you place one sheet of paper in your to-do box. The next day you add two more sheets. The next day you add four sheets, and continuing each day to double the number of sheets of paper added to the pile. Unfortunately, you are too busy to get to any of these items. At the end of the month (30 days), how tall will be the tower of paper be?

(The thickness of a sheet of paper is 0.004 in. Report your answer in miles: recall that 12 in = 1 ft, 5280 ft = 1 mi.)