Midterm 1

1. (16 points) For all the parts of this problem, let the annual discount rate be 3%.
a)   Find the present value of the following cashflow: receive $13,240 every year for 20 years with the first payment being 45 years from now.

b)   Consider the following cashflow: receive x dollars now and the same amount in a year from today, and pay $300k a year forever with the first payment being a year from today. What is the value of x in order for the present value of the cash flow to be 0?

2. (14 points) Consider a stimulus program that intends to spend $300 billion every year, for three years. Assuming a 3% discount rate,
a) what is the present value of the program?
b) how much would the present value increase if the $300 billion were spent at the beginning of each year rather than at the end?

3. (16 points) You are running a small business, and you have a checking account earning 1% annually compounded weekly. At the beginning of the month you have $1000. At the end of the first week you have revenues of $2200 and expenses of $1000 for that week. In the second week your revenues are $2000 and your expenses are $700. In the third week your revenues are $2100 and your expenses are $1100. In the fourth week, your revenues are $2200 and your expenses are $3000 (they are higher as you need to pay the rent).
a) How much money do you have at the end of the four weeks?
b) What is the minimum balance of the account over those four weeks? Does it ever drop below $1000?

4. (14 points) What is the effective annual interest rate of
a) a car loan with a 5% annual interest rate compounded monthly?
b) a credit card with a 24.7% annual interest rate compounded monthly?

5. (12 points) The price of home is $250k. Calculate your monthly payment if you get a mortgage with a 20% down payment at 15-year fixed annual rate of 3%.

6. (16 points) Five years ago you bought a home and took out a 30 year mortgage for 150k at 6%. Suppose you've made monthly payments of $1200. (Note: this may be higher than the minimum monthly payment.)
a) What is the remaining principal today?
b) What is the monthly payment if you would refinance the mortgage with a new 15-year mortgage at 3%?

7. (12 points) Consider a 30-year mortgage with a 5% interest rate and a 20% down payment. If you can afford a $1000 monthly payment, how expensive a house can you buy? How large is the down payment?