IEMS 326
Homework 1

Please show all work! See the syllabus for homework policies.

1. (A nice inheritance)
a) Suppose $1 were invested 100 years ago at 3% interest. Approximately how much would that investment be worth today: $10, $100, $1000, or $10,000.
b) What if the interest rate were 5%?
c) What if the interest rate were 4% and it was invested in the year 1812?

2. (A lottery prize) Suppose you win the lottery grand prize of $10 million. However you do not get this prize money immediately. You have the option of either receiving $5 million immediately or the full $10 million paid in 20 equal installments, one per year, the first installment being paid immediately. What is the present value of the second option at 3.5% interest? Which option is better?

3. Luenberger, Exercise 2.6. Instead of 12%, assume that the nominal annual interest rate is 6% and compounding is monthly. (Here you do have to worry about compounding. See Luenberger section 2.3.)

4. Newnan et al., Chapter 5 Problem 4 (p. 173).

5. Using the social security spreadsheet:
a) At least how big must the real rate of return be so that the trust fund does not exhaust its assets by 2050?
b) What is the effect of a ±10% change on the average taxable earnings per worker on the 2050 balance of the trust fund?
c) What is the affect of a ±100 basis point[1] change on the tax rate?

[1] A basis point is $1/100^{th}$ of a percent, or 0.0001. For example, adding 100 basis points to a tax rate of 12.4% means increasing the disability rate to 13.4%. This terminology helps us to be more precise: if I said, increase the tax rate by 1%, you might wonder whether I meant 12.4% + 1% = 13.4% or 12.4%*(1.01) ≈ 12.5%.