1. (Simple Calculations)
   a) Newnan et al. chapter 5 problem 14, but use a 3% discount rate instead of the one that is given.
   b) Calculate the present value of $1000/mo for 30 years with the first payment this coming January 1. Assume an interest rate of 1% a month and that “today” is October 1st. (This is a bit like a mortgage.)
   c) Luenberger, chapter 3 problem 3 (p 68)

2. Modify the social security spreadsheet to answer the following questions. Do not show your work and do not turn in the spreadsheet.
   a) What is the effect on the 2050 trust fund balance of a 100 basis points\(^1\) change in i) the real rate of return; ii) the labor force participation among 18-64; iii) the tax rate; or iv) the labor force participation among 65+?
   b) Suppose the population 18-65 grows an additional \(x\) million a year due to immigration. That is, add \(x\) million to the population in 2010, 2\(x\) million to the population in 2011, 3\(x\) ... Produce a chart showing how the 2050 trust fund balance (y-axis) changes with \(x\) (x-axis). For what value of \(x\) is the 2050 balance zero?
   c) Suppose medical technology will increase life expectancy. What would happen to the 2050 trust fund balance and the year it becomes negative if for the years 2020-2050, two things occur: i) the population 65+ is increased by 10% and ii) the population 65+ that is working is doubled?

3. (Saving for college tuition) Suppose that on 9/1/2020, you and your significant other have a child. You plan to open a 529 account at that point to save for the child’s future college expenses. The total cost of attending Northwestern for the 2011-2012 academic year is $58,429. Last year it was $56,006. Assume that this cost will increase at the same rate. You plan to put money into the 529 account each year starting from the child’s birth to their 18\(^{th}\) birthday, at which point they start college. Each year you will increase your contribution by 2% (as you get raises at your job). Assume that the investment return of the account is 3% annually; that expenses fall at the beginning of the academic year (September 1\(^{st}\)), and that your child will graduate in 4 years. How much should be in the 529 account when your child starts college (just after you make the contribution on their 18\(^{th}\) birthday)? How large should your first contribution be (on the child’s day of birth)? How will this amount change in the following scenarios: a) your child will take 5 years to graduate; b) your investment return is 8% annually and you increase your contribution by 4% each year. Turn in a 1-page print-out of a spreadsheet highlighting your answers.

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\(^1\) 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 tax 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 \(12.4\%*(1.01) \approx 12.5\%.\)