I recommend using graphs to illustrate your answers to these questions.

1. Amy signed a lousy labor contract: it provides that she must work through the end of next year regardless of the size of her salary (as long as the salary is a positive number). Her boss is allowed to set salaries by any method, reasonable or not. In addition, should she breach the contract and quit, she must pay $2 million dollars penalty in real dollars! In other words, she's stuck with the deal (she's not independently wealthy). (Let's not discuss enforceability of unconscionable contracts, all right?) Amy's utility (U) function for income (Y) is given by $U = Y^{1/2}$. She is faced with the following salary-setting method designed by her truly cruel boss: Amy's salary for next year will be determined on the flip of a coin (assume a fair coin). If the coin turns up heads, Amy receives $100,000. If the coin turns up tails, Amy receives $10,000.
    a) What is the expected value of this gamble?
    b) Give the utilities of each of the following:
        i) worst outcome of the gamble
        ii) best outcome of the gamble
        iii) utility of the expected outcome
        iv) expected utility of the gamble
    c) This gamble makes Amy unhappy. Her boss has a fit of kindness and says that Amy can avoid the gamble and have a certain salary, as long as she names a figure that will give her up to, but not more than, the expected utility she would have had under the gamble. What is the maximum salary that Amy can ask for while avoiding the gamble?
    d) In benefit-cost terms, what does the difference between your answers in a and c above represent?

2. Congress wishes to improve the lot of mine workers; however, it also faces pressure from the public not to raise taxes further, so instead of giving a direct handout to mine workers it passes legislation establishing a wage floor of $600 per 40-hour week. The legislation has not yet taken effect. The President has asked you to analyze the situation and advise her as to whether she should sign or veto the legislation. Demand for mine labor is given by $Q = 1000 - 0.25P$. Supply of mine labor is given by $Q = 2P - 125$.

    a) What is the current equilibrium price and quantity for mine labor?
    b) What change in consumer surplus will result if the legislation is enacted?

    The opportunity cost of waiting for a job is $6.00/hour. When jobs are allocated randomly, the average job seeker waits 50 minutes; when jobs are allocated on a first-come, first-serve basis, the average job seeker waits 1 hour.

    c) What change in producer surplus will result if the legislation is enacted and jobs are allocated randomly?
    d) What change in producer surplus will result if the legislation is enacted and jobs are allocated on a first-come, first-serve basis?
    e) If the President wants to support an amendment requiring a particular method of job allocation, which method should she support and why?

f) Should the President sign this bill? Why or why not?

3. A physician at the Centers for Disease Control and Prevention wants to know if it is cost-beneficial to screen people for the genetic disease hemochromatosis (HH). Some people who have this disease absorb too much iron in their liver and other organs. In the long run, this can lead to many medical problems, including cirrhosis of the liver, diabetes, and arthritis. Unfortunately, many people who have this disease are not diagnosed until extensive organ damage has already occurred. If such patients were identified through screening, it is possible that they could avoid medical complications through a simple treatment called phlebotomy (a procedure like donating whole blood), which removes excess iron from the body.

The average cost of screening for the disease is $29 per person (all dollar values in this problem are in real terms). The cost of one phlebotomy therapy session is $38. When a patient with HH is identified through screening, 16 phlebotomies are usually required in the year of diagnosis to remove accumulated iron from the patient's blood and organs. After the first year, a patient generally requires 4 phlebotomies per year to prevent iron re-accumulation. About 3 patients per 1000 screened prove to have the disease.

Suppose that screening occurs (once per lifetime) at age 30. Remaining life expectancy is 50 years. A patient undergoing phlebotomy therapy sees his/her physician once each year for monitoring. This physician visit costs $42.69. Treasury bonds currently earn 6% interest. The inflation rate is 3%.

The blood recovered in phlebotomies can be used in the same ways as any other blood drawn from healthy patients. The current market price of whole blood is $72 a pint, which is the amount drawn in a phlebotomy session.

a) Given the information you have from the wording of this question, what should you use as a discount rate, and why?

b) Outline a benefit-cost analysis of a program to screen all U.S. residents for HH at age 30. Use the information provided above to calculate those elements of the analysis that you can, and to identify those that are missing. Are there any plausible missing elements that could change the balance of benefits and costs that you can calculate? If so, be sure to identify them. If not, briefly explain why not.

4. Federal budgeting rules currently require that the revenue and expenditure implications of any proposal be added up over a five-year period. Generally, the rules do not require any discounting. for example, a plan to spend $100 million next year, and none for the succeeding four years, would be counted as $100 million in expenditure over five years, exactly the same as a plan to spend nothing for the next four years, and $100 million in the fifth year.

a) How might the rules described above bias expenditure and revenue decisions?

b) The current Treasury bond rate is about 7 percent, and the current inflation rate is about 3 percent. using these numbers, what is the maximum plausible magnitude of the bias discussed in (a) per dollar of revenue or expenditure over a five-year period?

(Note: to answer (a) (and, by extension, (b)), you will need to explicitly state the standard against which you are measuring bias and explain why that standard is unbiased.)

5. 10 days after the final game of the World Series this fall, the Publishers Clearinghouse Prize Patrol will award one very lucky entrant "Ten Million Dollars." Publishers Clearinghouse "Official Rules" provide the following information about how the $10 million "Super Prize" is paid out:

> The lucky winner will receive $250,000 the day the prize is awarded, $250,000 a year thereafter, plus a final payment of $2.5 million in the 30th year. The present value of these prizes will vary depending on interest rates and market conditions at the time of each award.

If you are the lucky winner, how much cash would Ed McMahon have to give you on the final day of the Series to get you to turn down the "Super Prize?" Assume a discount rate of 5%. (Also assume that tax consequences and any other potential complications have no differential effects.)

6. You have a crazy aunt that leaves you some money. She gives you three options for payout. Assuming a discount rate of 2%, which option should you choose and why?

Option 1: $50,000 in 1997
Option 2: $10,000 in 1997 plus $51,000 in 1998
Option 3: $ 3,987.25 in 1997 plus $80,000 in 2015

7. Assume that the discount rate is 7%. Calculate present values for the following:
   a) a cash flow of $15 per year forever
   b) a cash flow of $15 per year for 10 years
   c) a cash flow of $15 beginning 11 years from now and lasting forever
   d) a cash payment of $15 one year from now, $25 two years from now, and $30 four years from now

8. Some candidate for president says he has a tax plan which will raise $150 billion over five years.
   a) Assume that annual tax payments are equal under this plan, and that such payments would start a year from the enactment of the tax reform. What is the present value of the tax plan as of the date of enactment, given an interest rate of 4%?
   b) Suppose the above plan were to continue for another 23 years, with the same annual tax payments and interest rate as in part (a). Write down a compact expression for the present value of expected revenues under this plan.

9. Assume that there is only one investment opportunity available and everyone receives the same rate of return if they choose to invest in it (government or private investor notwithstanding). A

mid-level bureaucrat in Washington proposes the following pilot program to test an alternative to the traditional tax and transfer program (all values are in real terms):

Tax the non-poor $1 billion this year
Invest the money for 10 years at 10% return per year
Close the account, pay back $1.5 billion to the non-poor 10 years from now and give the remainder of the proceeds to the poor.

The bureaucrat claims that this pilot program will be a clear winner under either Pareto or Kaldor-Hicks. Is she right? Explain your answer and prove it with calculations. (I am not looking for a formal "proof"; I want something more than a text-only answer, however.)

10. A public hospital is being proposed for a historically poor area of Atlanta. Several old, burnt-out buildings will be demolished to make way for the new building. Proponents of the project claim that the project will produce two benefits:
    (1) Improved health for residents of the area who previously had limited access to medical care, and
    (2) An increase in surrounding property values of $1 million.

    a) Evaluate the proponent's arguments.

    An opponent of the project accuses the proponents of inflating the value of the project's expected benefit. He says, "The value of the health benefits is equal to the increase in property values--you can't count both!"

    b) Is the opponent's statement strictly correct? Why or why not?

11. Many people would like the city of Broadford to rebuild the main bridge connecting Broadford and Mallaig. They argue that the construction project would benefit the city by providing jobs to local residents who are currently unemployed. In addition, they argue that the project would yield benefits in the form of reduced welfare payments.

    a) Evaluate the proponents' arguments.
    b) The proponents of the bridge project also argue that the project is essentially costless since it will be financed out of federal revenue sharing funds to the city. Do you agree with this analysis? Please explain.

12. A citizen's group in Inverbervie has urged the School Committee to construct bleachers at the high school's football field and to charge admission to the school's games. The group claims that within ten years, admission fees will have covered the construction costs. The group also claims that "this project will benefit the entire community: not only will it give us a set of bleachers, but it will also create added revenues for the school from the eleventh year onward.

    Is the group correct that the added revenues should be counted as a benefit? Explain.

13. Crieff is considering developing a new playground. In a feasibility study, a consultant stated that the project would "benefit Crieff in two ways: (1) provide 10,000 user-days of recreation opportunities annually and (2) increase the value of surrounding residences by a total of $95,000."

    How would you measure the benefits of the new playground?

14. Dunvegan is considering two ways of developing a downtown block which is owned by the city. One option is for the city to build and operate a parking garage. The other is to sell the site to a private firm which would construct a parking garage.

    Proponents of a municipally-built garage argue that it would be less expensive for the city to build the facility than for a private operator. They claim that, since the city already owns the land, the only costs under this option would be for construction and operations. Since a private firm would have to buy the land, it would need to charge higher fees in order to recover its costs.

    Evaluate the proponents' arguments.

15. The city of Flodigarry is considering providing tax subsidies to encourage existing firms to expand and new firms to locate in blighted areas of the city. Supporters argue that the additional future taxes paid by these firms and by other commercial activities in the blighted areas will represent a major benefit of the tax subsidy program.

    Do you agree? What potential benefits from the program would you emphasize and why?

16. National concern about the labor market compensation of women in the island nation of Miso Genie has led the government to consider implementing a radical proposal. it is proposed that the government mandate that all firms that currently employ women raise the wages of all women who are currently working by $10 per hour. Further, no woman currently employed may be laid off or fired. There is significant occupational segregation in Miso Genie, so men and women do not work at the same firms. To help ensure wage parity, the new law would also mandate that firms that employ men must lower the wages that men receive by $10. Suppose that the labor supply of men in this country is $Sm = 200$ and that the demand for male labor is $Dm = 300 - 2Wm$, where Wm is the wage that men receive. For women, labor supply is given by $Sw = Ww$ where Ww is the wage that women receive; the demand for female labor is $Dw = 100 - 4Ww$. Let all owners of all firms in the economy be men.

    a) What are the equilibrium wages and employment of men and women in this economy prior to passage of the law?
    b) Calculate the gains and losses to men and women in this economy that the law would cause. Does this law pass a traditional Kaldor-Hicks test?

17. In response to rising crime rates on campus, a planning committee is trying to decide how many free emergency phones to put on campus. When the caller lifts the handset, these phones automatically (and only) dial 911 and transmit a location to the police dispatcher. The University

community consists of 3 groups of walkers, whose demands for quick-and-easy police contact vary with their typical travel times as follows:

Day	Qd = 35-P
Twilight	Qt = 70-2P
Night	Qn = 60-P

The cost function for emergency phones is TC = 40Q + 10.

a) Assuming that each group would pay according to its demand curve, how many phones would be provided in a competitive market?
b) Again assuming that each group would pay according to its demand curve, how many phones would there be in a community with only night-time walkers? How many phones would there be in a community with only day- or twilight-walkers?
c) What is the socially optimal, or economically efficient, number of phones on campus?
d) Suppose the University holds a simple democratic election to determine the number of emergency phones. Assume that each group has one vote, and that each group must pay 1/3 of the cost for phones. The ballot includes the following choices:
   20 phones
   25 phones
   30 phones
   35 phones
   40 phones
   Which number of phones would win the election? Would the election lead to an economically efficient result? Why or why not?
e) If the above number is not efficient, could any group bribe one or both of the other groups and make the election outcome more efficient? Please elaborate.

18. The Clinton administration is considering imposing a tax on energy use, partly to raise revenue and partly to reduce pollution. (You may assume that over the relevant range, the supply of energy is perfectly elastic).
   a) Under what conditions could such a tax both raise revenue and enhance welfare under the Kaldor-Hicks criterion? Explain briefly.
   b) Are there any conditions under which the imposition of the tax could be justified under the strict Pareto condition? Explain briefly.

19. The demand for delivered pizza in Ann Arbor is given by the equation P = 20 * Q, where P is the price in dollars and Q is the quantity of pizza delivered, per month, in thousands of pizzas. Delivered pizza can be produced (and delivered) at a constant marginal cost of $8.00, including a normal rate of return for the producers of pizza. Each box of pizza imposes social costs, arising from its disposal, of $0.05.
   a) Assuming no regulation or taxation in this industry, what is the equilibrium price and quantity of pizza produced per month?
   b) What would be the efficient level of production? Explain and calculate the sources of the efficiency gain (if any) that arise from production level (b) as compared to (a). (If there are none, show that the solution given by (a) is efficient.)

20. A study discovers that the basement of the public library has a concentration of radon of 2.5 picoCuries/liter, while the upper floors have virtually no radon. Working in the basement is estimated to increase the probability of contracting lung cancer and dying by 0.00014 per year of work. Librarians, aware of the study and of the effects of radon, demand a wage premium of $70 per year for working in the basement. What is the implicit "value of life" for librarians? Explain.