Questions and Problems, Ib (maximum of 60 points out of 55)

Instructions: Each problem is keyed by the number of points it is worth and the minimum page length. The page length refers to a page with one inch margins, times new roman font, and a font size of 12. A page will have a minimum of 23 double spaced lines. Include your name and question/problem number at the top of the page. This allows 20 lines for your response. Your response is to be typed, however, you may do mathematical calculations and graphs neatly in pen or pencil. Question/problems prefaced with an asterisk (*) are required. You may turn in as many questions/problems as you like, but the maximum number of points that can be earned is given at the top for each set. No questions/problems will be accepted after the assigned due date.

3-1 (10 pts, 1 page) Summarize prospect theory and illustrate it in the context of a proposed policy that if implemented would increase the probability of survival a certain endangered species by 10 percent. If the policy is not implemented the probability of survival will drop by 10 percent. If prospect theory provides a good explanation of the values we place on things like endangered species, and the impact on the endangered species was the deciding impact, would the valuation derived from prospect theory support or not support the policy? Explain why verbally and in terms of your illustration.

3-2 (10 pts, 1 page) Discuss the concept of using contingent valuation to determine the value of environmental benefits. What are the problems with the approach and how may they be avoided? What is the general view among economists with respect to the use of contingent valuation?

3-3 (10 pts, 1 page) Suppose there is an estimated relationship between annual visits, V, to Meramec State Park and travel costs, tc, measured in dollars. Specifically, \( V = 10,000 - 20tc \). If average travel cost is $100, how many visits does the equation predict? At that level of visits, what is the estimated consumer surplus? Using this method, what is yearly value of the park? Show the problem graphically.

3-4 (10 pts, 1 page) Discuss the basic concept of the Hedonic Approach to valuing environmental quality.

3-5 (10 pts, 1 page) Suppose the loss in the value of a residential house, \( L_H \), is observed to be systematically linked to the presence of a landfill. Specifically assume \( L_H = 10,000 - 2000M \) where \( L_H \) is the loss in value in dollars and M is the distance in miles. Suppose there is a proposal to locate a landfill in an area where there are 1000 houses located within a 5 mile radius of the proposed site. If the average distance from the site to a house is 2.5 miles, based on the hedonic approach, what is the estimated aggregate willingness to pay by home owners to prevent the location of the landfill?

*3-6 (10 pts, 1 page) Discuss the problems with using the Human Capital approach to valuing life and explain why economists prefer contingent valuation and hedonic pricing (e.g., empirical risk analysis) methods.

3-7 (5 pts, ½ page) Suppose a hedonic wage equation reveals that after controlling for other wage determining characteristics, an increase in the annual fatality rate from 4 in 50,000 to 6 in 50,000
is associated with an increase in annual pay of $200. Further suppose a pending project would cost $3.2 billion dollars and is expected to save 620 lives. Based on the hedonic wage approach, is the project efficient? Explain.

5-1 (5 pts, ½ page) Discuss the relationship between the Pareto Improvement efficiency criterion and the Kaldor-Hicks efficiency criterion.

5-2 (10 pts, 1 page) Consider two agents, Pork4US, and Trout Fishers Association, TFA. Pork4US is a large hog farm located on the banks of the Fleet River, a favorite trout fishing site by members of the TFA. As Pork4US has grown, so too has the runoff of fecal material to the detriment of trout fishers. Currently the runoff is 10,000 metric tons per year. A drain and filter system can be installed by Pork4US, but at a cost. Assume the cost is given by the relation: \( TC = 0.4R^2 \) where \( R \) is the amount of runoff prevented by the system measured in 1000s of metric tons and \( TC \) is the annual cost in dollars. Also assume the benefits of clean fishing have been estimated using contingent valuation surveys and hedonic pricing methods. A generally accepted estimate of the benefits of clean fishing is given by the relation: \( TB = -4 + 4R \) for \( R > 1 \), where \( R \) is defined as above, runoff prevented, and \( TB \) are total annual benefits in dollars. Show the problem graphically using a TB, TC diagram, and a marginal benefit, marginal cost diagram. Marginal benefits, \( MB \), associated with the TB equation is given by the equation, \( MB = 4 \), and marginal costs, \( MC \), associated with the TC equation is given by the equation, \( MC = 0.8R \). Calculate the efficient level of cleanup. What is the total cost, total benefit, and net benefit associated with the efficient solution?

5-3 (15 pts, 1 ½ pages) Revisit the Pork4US and TFA problem and discuss who should pay for the cleanup.

a. First, suppose the Coarse Theorem is applicable and property rights are assigned to TFA. Who pays for the cleanup? Why? Now suppose property rights are assigned to Pork4US, that is, they have the right to pollute the river. How much cleanup will take place? Who will pay for the cleanup?

b. Now apply the Polluter Pays Principle. How much cleanup would occur, what would it cost, and who would pay?

c. Assume that TFA is a group of rich businessmen all of whom drive SUVs and use cellphones while driving. Further assume Pork4US is a family farm with an annual income net of expenses is $25,000. Apply the Egalitarian criterion. How much cleanup would occur, what would it cost, and who would pay?

d. Make the same assumptions about Pork4US and TFA as in “c,” but apply the natural rights criterion. How much cleanup would occur, what would it cost, and who would pay?

e. The Rawlsian approach is derived from a simple thought experiment. He suggests we look at justice through a “veil of ignorance.” By this he means we know the specifics of each case, but we don’t know who we are. Suppose the two agents are viewing the problem through the “veil of ignorance,” which principle in Table 5-1 of your text do you think would emerge to resolve the problem? Explain why.

*5-4 (15 pts, 1 page) Discuss the Coarse Theorem and the conditions under which it is likely to be effective in dealing with negative externalities. Give an example of when it may be effective.
Also discuss the conditions under which the theorem is likely to be ineffective. Give an example of when it may be ineffective and explain why.

*6-1 (10 pts, 1 page) Define maximum sustainable yield, MSY. Would a profit-maximizing single owner of a fishery harvest more or less than the MSY? Explain why or why not. If the fishery were instead in open access with more than one user, would more or less fish be harvested than the MSY? Explain your answer.

6-2 (10 pts, 1 page, Use of a spreadsheet required) The growth of biomass function, \( AG = rX^*(1 - X/k) \) is derived from an \( S \)-shaped function \( X_t = k/(1 + ce^{-rt}) \) where \( c \) is a constant equal to \( (k - X_0)/X_0 \). The parameter \( r \) is the intrinsic rate of growth of the biomass, \( k \) is the carrying capacity of the environment, \( t \) indexes time, and \( e \) is the natural logarithm. Assume \( r = 0.2, X_0 = 1, \) and \( k = 500 \). Derive the time path of \( X \) from \( X_0 \) to \( X_{100} \), i.e., from \( t = 0 \) to \( t = 80 \). Do the same for growth \( AG \). Show \( X_t \) and \( AG \) graphically. The maximum growth is found by differentiating \( AG \) with respect to \( X \) and setting the result equal to zero. Maximum growth occurs at a stock, \( X \), equal to \( k/2 \). What is the maximum growth rate?

6-3 (5 pts, \( \frac{1}{2} \) page, Only in conjunction with 6-2). Suppose the biomass stock equals 500 units, \( X = 500 \) and annual harvest, \( H_1 \), is 30 units describe what will happen to the stock over time. Now suppose the harvest, \( H_2 \), is 25 units annually, what happens to the stock over time (again you are starting with a stock of 500). Last, suppose the harvest, \( H_3 \), is 20 units what happens to the stock over time starting at \( X = 500 \). Explain each case.

6-4 (5 pts, \( \frac{1}{2} \) page, Only in conjunction with 6-2). Consider harvest \( H_3 \). The parameters are the same as above except the initial stock is not 500 but 175 what happens to the stock over time? Now suppose the initial stock is 130, what happens to the stock over time? Explain each case.