Econ 3804 - Environmental Economics

Problem Set 1

This problem set is due on **Monday, September 29 at 3pm sharp**, at the Department of Economics main office drop box, located at C876 Loeb Building. Please note that this is a firm deadline, and late assignments will not be graded. You may work together with some other class mates, but you must write up your own work. Please complete all 3 questions.

1. Alvin's demand for bottled water is given by ${Q^d}_A = 8 - 0.5P$. Betty's demand function is ${Q^d}_B = 6 - P$. Calculate Alvin and Betty's marginal and total willingness to pay for bottles of water and illustrate graphically. Compute the aggregate demand for bottled water, assuming Alvin and Betty are the only consumers.

2. Consider a competitive (C) market for 'hamburger combos' (hamburger, fries, and a drink) at a fast food restaurant with the following aggregate demand (P_D) and aggregate supply (P_S) relationships:

$$P_D = 30 - 0.5Q_D$$
$$P_S = 10 + 0.5Q_S$$

   (a) Graph these equations in a Demand/Supply diagram (be sure to show the value of any intercept points and label the axis). Calculate the competitive market equilibrium price (P_C) and output (Q_C), and show them on the graph. Show your calculations.

   (b) Suppose that a negative pollution externality in 'hamburger combos' exists resulting from the health damages of air pollution produced in the production process. Calculate the socially efficient equilibrium price (P^*) and output (Q^*) given that the socially efficient demand (MWTP) and supply (MSC) for 'hamburger combos' is as follows:

$$MWTP = 30 - 0.5Q_D$$
$$MSC = 20 + 0.5Q_S$$

   (c) Graph your results from part (b) in a new Demand/Supply diagram and show the total social benefits (willingness to pay) and costs from the socially efficient price and output (identify these areas in your diagram using A, B, C, etc.). Calculate and explain the net social value in the socially efficient equilibrium. Show your calculations.

(d) Based on your results in parts (a), (b), and (c) use a new Demand/Supply diagram to show the area of the total social benefits, total social costs, and the dead weight loss (DWL) from the competitive market economy. Calculate and explain the net social value as well as the value of the DWL from the competitive market economy. Show your calculations.

3. Consider a pulp mill that emits air and water pollution emissions (E) that impose negative external costs (damages) onto society. The aggregate marginal abatement cost (MAC) and marginal damage (MD) curves have been estimated follows:

$$MAC = 750 - 25E$$

$$MD = 25E$$

(a) Using the MAC/MD diagram, plot the MAC and MD curves. Be sure to label the curves and intercept points, and show any calculations.

(b) Explain and compute the unregulated, competitive economy equilibrium level of emissions (E^C). Show this equilibrium on the diagram in part (a). Then, show and compute the total abatement costs (TAC) and total damages (TD) imposed on others from this level of emissions. Calculate the total social cost of E_C.

(c) What is the total social cost of E=25? Compute and show your answer on a separate graph.