First Quiz Econ. 8545 Environmental Economics, January 25, 2000

This first part of this quiz is due next Monday. The second part is due next Weds. Each part will take significant effort. Make every effort to make sure you have everything correct before you go on to the next part. This quiz might take a lot of your time. Feel free to consult with others in the class.

I will grade each part out of 10 points; most quizzes will be graded out of 10 points.

I. Welfare Economics: A Review

Assume a two person (A and B), two good (X and Y) world where the two goods are available in the fixed quantities $X = 10$ and $Y = 14$. The initial allocations are $X^a = 6$, $X^b = 4$, $Y^a = 9$ and $Y^b = 5$. Further assume that $U^a = X^aY^a$ and that $U^b = X^bY^b - X^a$.

Normalizing the price of good X to one (i.e., $p_x = 1$), solve for the competitive equilibrium price ($p_y$) and quantities ($X^a$, $X^b$, $Y^a$, $Y^b$). In addition to the math, explain, in words, what you are doing. Note that you are solving for a competitive equilibrium, not a barter equilibrium.

End of part 1

Now demonstrate, as rigorously as you can, that this competitive equilibrium is not efficient. Again, make sure to explain, in words, all of your steps. As part of your answer, define efficiency both in words and in terms of mathematical conditions. Interpret, in words, those mathematical conditions. Derive the efficiency locus (i.e., a function that describes the efficient amount of $Y^a$ as a function of $X^a$). Graph the locus.

Now determine, the tax rate, t, on individual A's consumption of good X that would cause the competitive equilibrium, in the presence of this tax, to be efficient. The tax rate is per unit of X consumed by individual A and is expressed in dollars. Assume the tax revenues collected on
individual A's consumption of good X are given to individual B in a lump sum in such a way that individual B is not aware of their source.