Problem Set 2: Externalities. Due Tuesday, February 24th, 2015

1. The market for gasoline is perfectly competitive, and is defined by the marginal benefit (inverse demand), marginal cost (inverse supply), and marginal external cost functions

$$MB = 180 - \frac{3}{10}q \qquad MC = 20 + \frac{1}{10}q \qquad MEC = 40$$

1-1. Equilibrium without intervention or coordination. If the negative externality goes completely un-internalized, find the equilibrium q, p (price), TES (total economic surplus), and DWL (deadweight loss).

1-2. Efficient resolution. Without yet being specific about how efficiency is achieved, characterize the Pareto efficient state of this market in terms of q and TES. Explain why $DWL = 0$ in this case.

1-3. Coasian bargaining. Describe what would have to occur for efficiency to be reached through Coasian bargaining.

1-4. Optimal government policy. What tax on gasoline would lead to efficiency? What cap in a cap-and-trade program would lead to efficiency?

1-5. Super-optimal tax, part 1. Find q, p, TES, and DWL if the government over-estimates the marginal external cost, and imposes a gasoline tax of $\tau = 60$. Relative to 1-1, has the government done more good or harm, in terms of efficiency?

1-6. Super-optimal tax, part 2. Find q, p, TES, and DWL if the government over-estimates the marginal external cost, and imposes a gasoline tax of $\tau = 80$. Relative to 1-1, has the government done more good or harm, in terms of efficiency? Can you extend this to a slightly more general conclusion (while still assuming linear MB, linear MC, and constant MEC)?

2. Tragedy of the commons. Suppose that there is a pasture somewhere that can be used for goat grazing. In the nearby village, any amount of goats can be purchased, for $40 each. If the number of goats that people buy and keep in the pasture is x, the revenue that can be derived from the goats living in the pasture (e.g. from their milk, or whatever) is $R(x) = 120x - 2x^2$. (This function is concave and eventually decreasing in x due to the fact that the goats will be less healthy if they have less grass to eat.)

2-1. If a profit-maximizing monopolist controls the pasture, how many goats will they choose to pasture, and what will be their goat-related profit?

2-2. If the pasture is a non-excludable common resource, and the world is teeming with entrepreneurs seeking to profit from goat husbandry, how many goats will be on the pasture in equilibrium, and how much profit will be gained from the pasture? (Assume that each goat on the pasture yields the same revenue.)

2-3. Suppose that the pasture is still open to all, but the government is able to charge a per-goat tax. What is the most efficient tax, how much revenue does the government get in the equilibrium, and how much profit do the goat owners get?