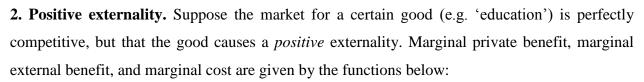## Problem set 3, due Wednesday, 10/23/13

1. Common resource. 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 $50 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 $R(x) = 450x - x^2$. (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.)

a) If a profit-maximizing monopolist controls the pasture, they will choose to keep _____ goats there. In this case, the monopolist's goat-related profit is _____.

b) If the pasture is a non-excludable common resource, and the world is teeming with entrepreneurs seeking to profit from goat husbandry, then the equilibrium number of goats on the pasture is _____. (Assume that each goat on the pasture yields the same revenue.) In this case, the total profit gained from the pasture is _____.

c) Suppose that the pasture is still a non-excludable common resource, but that the government wishes to introduce a per-goat tax on the use of the pasture, in order to cause the field to be used efficiently (in the sense of maximizing revenue net of costs). To do this, they should levy a tax of _____ per goat. If they do so, the goat entrepreneurs' profit will be _____, and the government's revenue will be _____.

2. Positive externality. Suppose the market for a certain good (e.g. 'education') is perfectly competitive, but that the good causes a *positive* externality. Marginal private benefit, marginal external benefit, and marginal cost are given by the functions below:

$$MB = 200 - \frac{1}{25}Q \qquad\qquad MEB = 110 \qquad\qquad MC = 60 + \frac{1}{100}Q$$

a) No policy. Given that there is no policy to address the externality, find the equilibrium quantity, price, consumer surplus, producer surplus, external benefit, and total economic surplus.

$Q^* =$ _____ $\qquad\qquad P^* =$ _____ $\qquad\qquad CS^* =$ _____

$\qquad\qquad PS^* =$ _____ $\qquad\qquad EB^* =$ _____ $\qquad\qquad TES^* =$ _____

Graph the market with no policy intervention, labeling CS^*, PS^*, and deadweight loss (DWL).

b) Pigovian subsidy. To maximize total economic surplus, the government should offer a subsidy of $\sigma^o =$ _____ per unit to the consumers. Given this, find the equilibrium quantity, price, consumer surplus, producer surplus, external benefit, government expenditure, and total economic surplus.

$\qquad\qquad Q^o =$ _____ $\qquad\qquad P^o =$ _____ $\qquad\qquad CS^o =$ _____

$PS^o =$ _____ $\qquad EB^o =$ _____ $\qquad GE^o =$ _____ $\qquad TES^o =$ _____

Graph the market with the subsidy, labeling CS^o and PS^o.

Supplementary questions

1. What is meant by the 'tragedy of the commons'? Under what circumstances do we expect this to occur? Give an example.

2. Give two examples of externalities – one positive and one negative.

Note: try to make your examples original and thought-provoking, and different from ones used in class so far. Consider the question of how your examples might be remedied, e.g. by government policy, Coasian bargaining, etc.

3. Draw the graph for problem 2 in the problem set. Shade the area representing the deadweight loss from the externality. Explain clearly why

a) This area represents the deadweight loss, and

b) a Pigovian subsidy equal to the marginal external benefit doesn't create a deadweight loss in this case, although it would do so if there were no externality to begin with.