FIRST TEST. ECON 237, SPRING 2015. NAME: _____

Fill in the blanks, and answer in the spaces provided. Show your work.

1. A public good (12 pts). The Village of Stansville contains five people, named Person 1, Person 2, etc. They are deciding how many fireworks to purchase for their yearly Stan'sday celebration. All residents of Stansville enjoy fireworks, but some enjoy them more than others. Thus, the marginal benefit functions for the five people are different:

$$MB_1 = \frac{120}{y} \qquad MB_2 = \frac{150}{y} \qquad MB_3 = \frac{190}{y} \qquad MB_4 = \frac{240}{y} \qquad MB_5 = \frac{300}{y}$$

where y is the number of rockets detonated during the celebration. The marginal cost (i.e. the price) of fireworks is $MC = 10$ dollars per rocket. (We can suppose that fractional rockets are possible, but we won't worry about how this works.)

a) If the people are purely selfish and must contribute to the fireworks fund in an uncoordinated way, the Nash equilibrium number of rockets is _____.

b) The Pareto optimal number of rockets is_____.

c) Suppose that it is agreed that each citizen will pay 1/5 of the cost of the fireworks, and the number of fireworks purchased will be determined by majority rule. Given this agreement, person 1's first choice of fireworks quantity is y_1^* =_____. Person 2's first choice is y_2^* =_____. Similarly, we have y_3^* =_____, y_4^* =_____, and y_5^* =_____. The unique equilibrium in majority voting is y_{mv}^* =_____.

d) If you know the marginal benefit functions of all individuals, you could assign the Lindahl shares s_1 =_____, s_2 =_____, s_3 =_____, s_4 =_____, and s_5 =_____. With the cost shares assigned in this way, the society would vote unanimously for _____ rockets to be purchased.

2. A negative externality (16 pts). 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:

$$MB = 16 - \frac{1}{10}q \qquad MC = 4 + \frac{1}{10}q \qquad MEC = 4$$

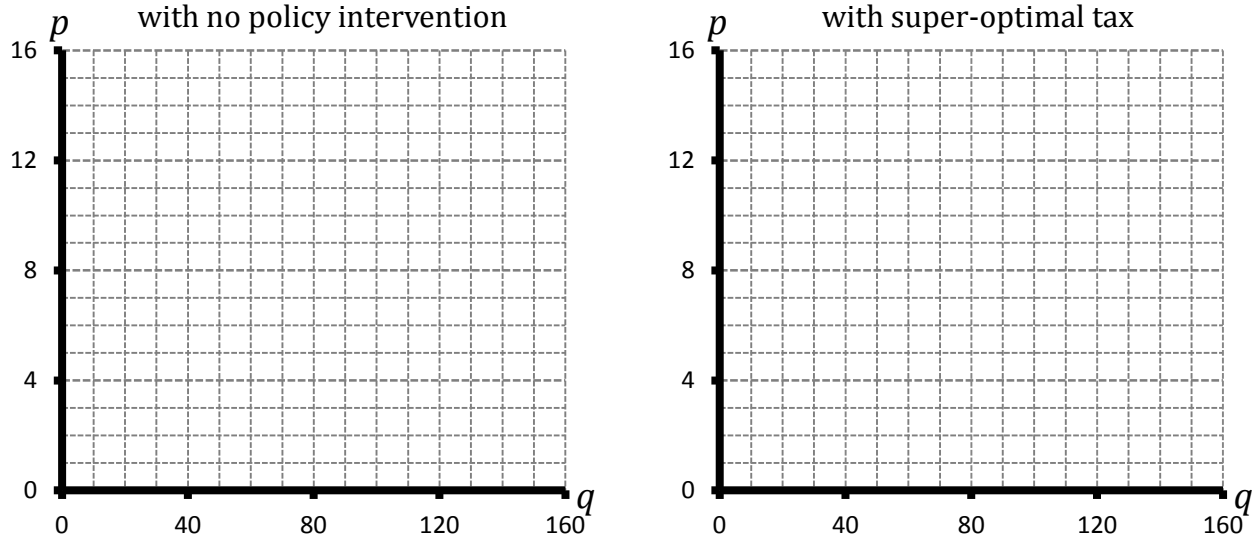
a) Equilibrium without intervention or coordination. If the negative externality goes completely un-internalized, find the equilibrium q, p (price), TES (total economic surplus), and DWL (deadweight loss).

b) 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.

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

d) Super-optimal tax. Find q, p, TES, and DWL if the government over-estimates the marginal external cost, and imposes a gasoline tax of $\tau = 6$. Relative to (a), has the government done more good or harm, in terms of efficiency?

e) Graphing. On the left, graph the market in part (a), labeling consumer surplus (CS), producer surplus (PS), total external cost (TEC), and deadweight loss (DWL). On the right, graph the market in part (d), with the super-optimal tax, labeling CS, PS, TEC, DWL, and government revenue (GR).



3. Tragedy of the commons (5 pts). 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 \$10 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 $R(x) = 410x - 4x^2$. (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, how many goats will they choose to pasture, and what will be their goat-related profit?

b) 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.)

4. Coase theoem (7 pts). Suppose that there is a steel factory that can only operate if it is allowed to pour sludge (an industrial byproduct) into a nearby stream, where it negatively impacts the profits of a local fisherman. For simplicity, assume (with sincere apologies to the fish themselves) that no one else has a stake in this one way or another. Let the $G be the profit gained by the factory if they are able to emit sludge, and let $L be the loss to the fisherman if sludge is emitted. Assume that property rights are clear, and perfect bargaining is costless. In this environment, explain what the Coase theorem predicts in the following four cases: (1) G>L and the fisherman has the legal right to prevent pollution, (2) G<L and the fisherman has the legal right to prevent pollution, (3) G>L and the factory has the legal right to pollute, (4) G<L and the factory has the legal right to pollute.

5. Public goods (7 pts). Define precisely what economists mean by a 'public good'. Explain why decentralized markets for public goods are generally not efficient, and why government may be able to improve efficiency. Explain all of this in a very clear way, as though you were explaining to a roommate without a background in economics. That is, define all special terms (jargon) you use, and construct a clear logical progression from beginning to end.

6. Black's majority voting equilibrium (3 pts). In 1(c), we construct a simple majority voting equilibrium that is an application of Black's (1948) theorem. Briefly, explain how this equilibrium is defined, and why the outcome you find is uniquely stable.