

MIDTERM EXAM, ECON 4044, SPRING 2012 NAME: _____

Fill in the blanks, and/or answer in the space provided. You must show correct work for credit.

1. Public good – non-rival and non-excludable. Suppose that, in a certain town with only five people, the park is a non-rival and non-excludable good. The utility functions for each citizen i can be represented as $U_i = x_i + \alpha_i \ln y$, where y is the amount of money that the town spends to build its park (so $p = 1$), and x_i is the amount of money that person i has left over for private consumption. The α_i values are as follows: $\alpha_1 = 1$, $\alpha_2 = 4$, $\alpha_3 = 8$, $\alpha_4 = 13$, and $\alpha_5 = 19$.

1-1. What is the Pareto efficient expenditure on the park, y^o ? _____

1-2. If the citizens of this town are absolutely incapable of coordination and bargaining, what is the Nash equilibrium expenditure on the park? _____

1-3. If the citizens of the town agree to divide the cost of the park evenly among them, and then decide how much to spend on the park using a process of iterative majority rule voting, what value of y will be an equilibrium in this voting process? _____

1-4. An amazing psychic visits the town, and makes the citizens' utility functions known to each other. Armed with this knowledge, they decide to implement a Lindahl tax scheme. Thus, they decide that the fractional park cost shares will be $s_1 =$ _____, $s_2 =$ _____, $s_3 =$ _____, $s_4 =$ _____, and $s_5 =$ _____. Given these tax shares, the majority voting equilibrium will be $y =$ _____.

2. Common resource – rival but not excludable. 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.)

2-1. 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 _____.

2-2. 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 _____.

2-3. 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 _____.

3. Excludable public good / natural monopoly – non-rival but excludable. The town of Blacksburg wants to build a wax sculpture museum, to benefit mankind. The fixed cost of building the museum is \$7,000, but once it is built, the marginal cost of an extra visit is zero. Demand for museum visits is given by the marginal benefit function $MB = 80 - \frac{1}{10}q$, where q is the number of visits.

3-1. If the museum is run as a profit-maximizing, monopolistic company, what will it charge museum-goers for each visit? $p_m^* =$ _____ At this price, there will be $q_m^* =$ _____ visits, consumer surplus will be $CS_m^* =$ _____, producer surplus will be $PS_m^* =$ _____, and total economic surplus will be $TES_m^* =$ _____.

3-2. Suppose that the government lets everyone into the museum for free, and finances the building cost using tax revenue. The number of museum visits will be $q_{mcp}^* =$ _____, and consumer surplus will be $CS_{mcp}^* =$ _____. If there is no deadweight loss associated with raising the extra tax revenue, then total economic surplus is $TES_{mcp,1}^* =$ _____.

On the other hand, if each dollar of tax revenue used to finance the museum causes 50¢ of deadweight loss, then the total economic surplus generated by the museum project, net of this deadweight loss, is $TES_{mcp,2}^* =$ _____.

3-3. What if, instead of financing the museum with tax revenue, the government decides to charge an admission price equal to average cost (F/q). The Pareto-dominant market-clearing quantity that satisfies this constraint is $q_{acp}^* =$ _____, and the corresponding market price is $p_{acp}^* =$ _____. The resulting consumer surplus is $CS_{acp}^* =$ _____, the producer surplus is $PS_{acp}^* =$ _____, and the total economic surplus is $TES_{acp}^* =$ _____.

4. Clarke tax. There are five individuals who wish to use a Clarke voting mechanism to choose among three options: A, B, and C. Sincere utilities (in dollar amounts) for the different options are given in the first table below. Assuming that everyone votes these sincere utilities, which option will be chosen? _____ Use the table in the middle as an intermediate step toward filling in the tax table on the right.

	A	B	C
1	10	5	0
2	8	4	0
3	0	9	4
4	0	8	3
5	10	0	20

	A	B	C

	tax
1	
2	
3	
4	
5	

Explain how voters 3 and 4 can game the system, if the remaining voters express their sincere preferences.

5. Game theory, rule of law

		strong	
		steal	don't
weak	productive	0 27	10 20
	not	4 17	4 20

If this is a sequential game, is there a Nash equilibrium? (yes or no) _____

Is there a pure strategy Nash equilibrium? (yes or no, still sequential) _____

If this is a sequential game, in which the 'weak' player moves first, what is the (subgame perfect) Nash equilibrium? (Hint: use backward induction.) Comment briefly on how this example illustrates broader difficulties faced by societies in which property rights are tenuous.

6. Market failures. Describe four distinct types of market failures, i.e. reasons why markets with particular characteristics are likely to function in an inefficient manner without government intervention. Try to explain clearly why each market failure occurs, and what kinds of intervention can be used to address them.

7. Benefits of efficient markets. Construct a logical argument in favor of the notion that markets possessing certain qualities (i.e. those that rule out the market failures above) will address the following questions in an efficient manner:

- A. What goods will society produce?
- B. How will these goods be produced?
- C. Who will consume which goods?

8. Public goods.

What is the definition of a non-rival good?

What is the definition of a non-excludable good?

Whereas decentralized, private markets can often be used to approximate the Pareto efficient quantity of a private good, it is challenging to find a comparable method to reveal the Pareto efficient quantity of a public good. Explain clearly why this is true. Review some of the different methods that might be used to attempt this, and comment on their strengths and weaknesses.