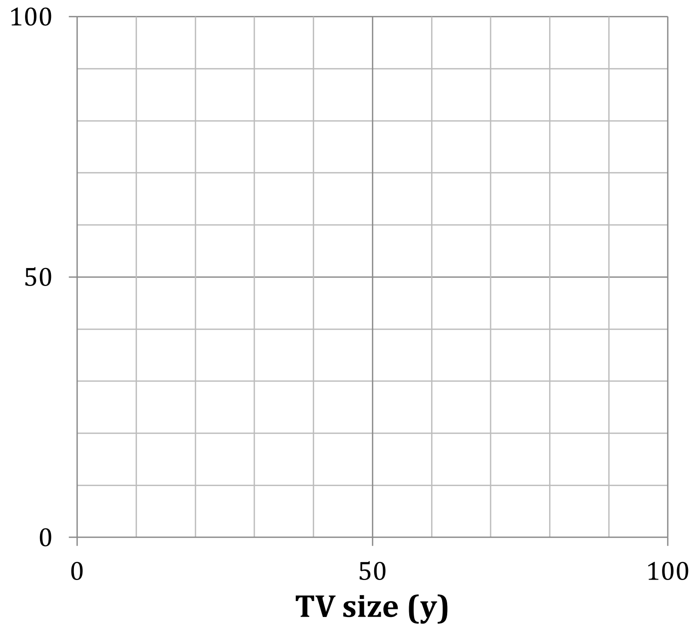
Problem set 1, due Monday, 9/23/13

1. Four roommates are deciding how many lava lamps to get for their common room. Suppose that, for their purposes, lava lamps are entirely non-rival and non-excludable, and that each lava lamp costs $30. Each roommate has the same individual total benefit schedule, and thus the same individual marginal benefit schedule, given in dollar amounts in the columns below marked TB_i and MB_i, respectively. Fill in the missing information in the table below, i.e. the columns for MSB (marginal social benefit), TSB (total social benefit), TC (total cost), and TES (total economic surplus). If there is no possibility of collective action, and each roommate must decide privately how many lava lamps to buy, then the equilibrium quantity will be _______. However, the socially optimal quantity of lava lamps is _______. Thus, the total amount of economic surplus that can be gained from collective action is _______.

Q	TB_i	MB_i	MSB	TSB	TC	TES
1	35	35				
2	60	25				
3	80	20				
4	95	15				
5	105	10				
6	110	5				
7	110	0				

2. Five roommates are deciding on the size of the TV screen they will get for their common room. Each of the five roommates has the individual total benefit function $TB_i = 20y - \frac{1}{10}y^2$, where y is the width of the screen, in inches. The marginal cost of a screen-inch is constant at $MC = 10$ dollars; that is, a y-inch TV costs $10y$ dollars. If there is no possibility of collective action, and each person must decide privately how much to donate to the 'TV fund', then the equilibrium TV size will be _______, and total economic surplus will be _______. However, the socially optimal TV size is _______, which gives a total economic surplus of _______.

2, continued



On the graph to the left, draw the marginal individual benefit (MB_i) and marginal social benefit (MSB) curves. Mark the Nash equilibrium without coordination (y^*) and the Pareto optimum (y^o). Shade in the area that represents the difference in economic surplus between the equilibrium and the optimum.

3. 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, and x_i is the amount of money that person i has left over for private consumption. The α_i values are as follows: $\alpha_1 = 20$, $\alpha_2 = 21$, $\alpha_3 = 23$, $\alpha_4 = 26$, and $\alpha_5 = 30$.

What is the Pareto efficient expenditure on the park, y^o? ___________

If the citizens of this town are absolutely incapable of coordination and bargaining, what is the Nash equilibrium expenditure on the park? ___________

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? ___________

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 $y =$ ________.