Econ 344 Public Finance
Spring 2005

Midterm Exam 1 Name_____

- The duration of the exam is 1 hour 20 minutes.
- The exam consists of 7 problems and it is worth 100 points. The extra credit problem will only be counted if you lose points on other problems.
- Please write in the space provided. If necessary, write on the back of the page.
- Please ask me if you have any questions.
- To receive full credit you have to carefully explain all your answers and show all your work.

General advice: *If you get stuck in the early parts of a problem, do not stop there. You can receive substantial partial credit by explaining how you would solve the rest of problem if you had the necessary answers from its previous parts.*

1. (15 points) In your own words explain what Median Voter Theorem states. Assuming that there are two parties in a country, what does this Theorem imply in terms of politicians positioning themselves (in the left-center-right spectrum) during elections? Name at least three complications that arise in real life that may render the predictions based on this theorem implausible?

Median Voter Theorem means that if everyone's preferences are single-peaked, then the most preferred outcome of the Median Voter (exactly the same number people preferring outcomes 'to the left' and 'to the right') is going to be chosen as a result of majority voting. Political leaders of the two parties in this country would try to position themselves at the point where Median Voter is located. Towards the elections politicians were observed to become more 'centrist'. The politician is going to win extreme wing of his party anyway, the challenge is to win more people in the 'center'.
Complications:

- **Most real world problems are multidimensional, so Median Voter Theorem doesn't apply.**
- **Ideology (politicians have beliefs that prevent them from positioning themselves exactly in the middle).**
- **Personality.**
- **Leadership (change the distribution of voters – instead of reallocating towards Median Voter – persuade Median Voter to change her position)**

2. (10 points) For each of the societal goals below determine and briefly explain whether it follows more from organic or mechanistic view of the government:
    a. To be the first nation to land on the Moon.

This one is more consistent with the organic view of the government. Trip to the Moon may or may not improve the wellbeing of citizens in this society. The point is

that being first here has more to do with promoting national ambitions rather than individual ambitions.

b. To insure that individual property rights are well protected.

This is consistent with the mechanistic view of the government because it directly promotes the interests of citizens of this country.

c. To improve citizens' ability to move around by building a road.

Similarly to part (b), this goal is also consistent with mechanistic view of the government because it also promotes interests of individuals as opposed to interests of the society as a whole.

3. (10 points) There are a number of policy initiatives intended to replace government welfare programs (financed through taxes) by privately charity (organized by churches and other local community centers). Can 'fair income distribution' be considered a public good? Do you think that there would be enough of this good if income redistribution is left to people themselves? Relate your answer to the free-rider problem.

The good called 'fair income distribution' can certainly be considered a public good. Once the distribution is fair everyone can enjoy it for free (non-rival) and it is impossible to exclude everyone from consuming it (non-excludable). As we already know, the free rider problem can prevent markets from providing optimal amount of the public good (or from providing it at all). If an individual provides one more unit of the good (makes a donation to a charity) she fails to appreciate the benefits to everyone else in the society (in other words, her donation has a positive externality that affects everyone else). Since donor only takes into account her own private costs and benefits, she underprovides the charity. It is likely therefore that there would be underprovision of 'fair income distribution' if society moves from government welfare programs to private charity.

4. (25 points) Consider a simple two-person exchange economy. Mark and Erin consume two goods – posters of Britney Spears (pBS) and posters of Justin Timberlake (pJT). Currently, Mark consumes 10 pBSs and 5 pJTs, Erin consumes 3 pBSs and 9 pJTs. Mark's marginal rate of substitution of pBSs for pJTs is one ($MRS_{BSJT}^{M}=1=MU_{BS}^{M}/MU_{JT}^{M}$), Erin's marginal rate of substitution of pBSs for pJTs is 0.5 ($MRS_{BSJT}^{E}=0.5=MU_{BS}^{E}/MU_{JT}^{E}$).
   a. Define a Pareto efficient allocation.

An allocation is called Pareto efficient if it is impossible to improve the welfare of at least one individual without hurting someone else. Important point to make here is that there could be a Pareto efficient allocation where $MRS_{BSJT}^{M} \neq MRS_{BSJT}^{R}$, so that definition doesn't involve MRsS.

b. Is the allocation provided above Pareto efficient? If so, explain why. If not, show a possible Pareto improvement.

The allocation given above is not Pareto efficient. Pareto improvement: I take one Britney Spears poster from Erin (she loses X units of utility) and give it to Mark (he gains Y units of utility). Now, I also take Justin Timberlake poster Mark (he loses exactly Y units of utility because $MU_{BS}^{M}=MU_{JT}^{M}$) and give it to Erin (she gains 2X units of utility because $2MU_{BS}^{E}=MU_{JT}^{E}$). Mark is as well off as before, while Erin is better off (by X units of utility).

c. If there was a competitive market for each type of posters, would these markets produce Pareto efficient allocation?

Yes, markets would produce Pareto efficient allocation since conditions of the First Welfare Theorem are satisfied:

- **These markets are competitive**
- **There exists a market for each type of posters**

5. (15 points) Consider a local power plant that emits sulfur dioxide into the air. The marginal private benefit of this power plant is given by MPB=100-Q. The marginal private costs are given by MPC=30. The marginal damage to other people is given by MD=0.5Q.
   a. How much output is this power plant going to produce? Show your work.

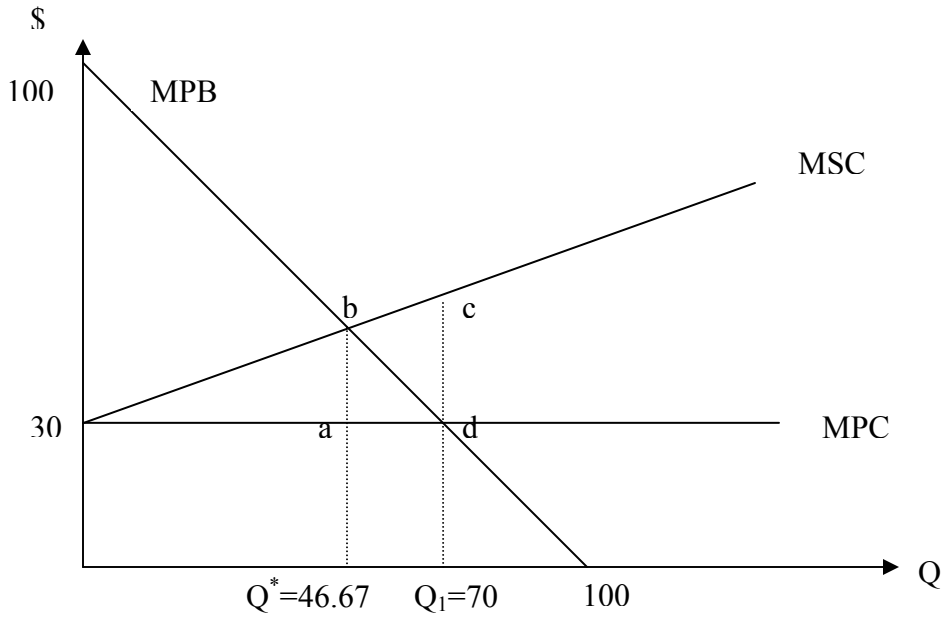
Plant produces where its MPB is equal to MPC: MPB=100-Q= MPC=30, so $Q_1=70$.

b. What is the efficient level of output? Show your work.

Efficient output is found where Marginal Private Benefit is equal to Marginal Social Costs (MSC=MPC+MD=30+0.5Q): MPB=100-Q= MSC=30+0.5Q, so $Q^{*}=46.6$.

c. What is the net welfare gain to society from moving from output in part (a) to optimal output in part (b)?

Refer to the figure below. The gain to those suffering from pollution is given by the area 'abcd'. The loss to power plant is given by the area 'abd'. The net gain is therefore given by the area 'bcd'=1/2*(70-46.67)*(MSC(Q_1=70)-MPC(Q_1=70))= 1/2*(70-46.67)*(65-30)=408.275.



6. (25 points) Consider two neighbors Terry and Rob. They both plan to produce fireworks on the New Year's Day. The (inverse) demand functions are given by: $P_T=100 - Q_T$; $P_R=100 - Q_R$ (quantities are expressed in number of rockets used); the marginal cost is given by MC=80=const.
   a. First suppose that Terry and Rob can prevent each other from watching the fireworks that each of them produces. In other words, fireworks display is excludable and is therefore a private good. What is the efficient number of rockets used by both Terry and Rob in this case? Show all your work.

First we have to find the total demand in this economy. In case of private goods, we perform *horizontal summation* of individual demand curves. We first invert both of the individual demand curves

$Q_T=100-P_T$, $0<= P_T<=100$; $Q_R=100-P_R$; $0<= P_R<=100$

Then we sum the two demands (we sum quantities for each level of price) to get

Q= 200 –2P, 0<=P<=100

Now, to find the equilibrium in this market, we need to invert it back (to be able to equate it with supply, which is expressed in dollar terms)

P = 100 – 1/2Q, 0<=Q<=200

So Supply = 80 = 100 – 1/2Q=demand produces the following quantity

$Q_{pr}^*=40$, $P_{pr}^*=\$80$.

We know that in private good case, competitive markets produce efficient result.

b. Now assume that it's impossible to exclude neighbors from watching and enjoying fireworks. Now fireworks display is a public good. What is the efficient number of rockets in this case? Show all your work.

Again, we have to find the total valuation in this economy. In case of public goods, we perform *vertical summation* of individual demand curves. This amounts to summing the inverse demands given in the setup of the problem. P=200-2Q

Now, to find the efficient level of public good, we just set our total valuation schedule given above equal to supply (=80)
So 80 = 200 – 2Q

By solving the equation above we get quantity Q_{pb}^{*}=60, P_{pb}^{*}=$80.

c. Define the free-rider problem. Based on your results in parts (a) and (b), comment if free-rider problem is present in this dorm-room?

Free rider problem is an incentive for an individual to claim that his valuation of a good is lower than it actually is. Both Terry and Rob have an incentive to say that 'I don't really care about fireworks'; at the same time hoping that his neighbor will produce fireworks for everyone to see and enjoy. As a result, the amount of fireworks that markets produce is suboptimal.

7. (extra credit 5 points) There is an interesting phenomenon that exists in San-Francisco Bay area. It is called 'casual car-pooling'. People driving from Berkeley to San-Francisco voluntarily stop at a certain parking lot and pick up people who need a ride to SF. People who need a ride to SF just show up at this parking lot and stand in line to get a ride. Most of the drivers are relatively well-off (if they have enough money to park in downtown SF). Interestingly, they do not take any money. So costs to passengers are virtually zero (you don't even have to maintain some small talk with the owner of the car). This system already exists for more than 15 years. Can you explain this phenomenon using the theory of externalities and public goods?

It should be clear that car owners wouldn't do it unless they extracted some benefit from it. This means that other people's utilities enter their own utility function. In other words, passengers' happiness has a positive externality – it makes car owners feel better. Most of us would feel well by helping someone even for free (it costs driver virtually nothing; she is going in the same direction with or without passengers). The question is why this doesn't happen in other places? Intuitively, such a system (or hitch-hiking in general) poses significant risks for drivers (some maniac may be looking for a victim on the road) and it significant costs for hitch-hikers (it's no fun to beg people to give you a ride for free). These costs outweigh the benefits for most people in most places. The costs for hitch-hikers go down if sufficient number of people does the same (that is there is positive externality from

participating – other people don't see hitch-hiking in the negative light anymore). From the driver's perspective, there is a public good called 'being a law-abiding and generally nice hitch-hiker'. If every hitch-hiker is nice and non-violent so that there is no risk for driver and if a lot of people start participating in this system, the costs of having it around to both drivers and passengers becomes low and it works.