MA Comprehensive Examination in Microeconomics

Saturday 10th January, 2009

Instructions

There are 6 pages in total, including this one. There are 10 short questions and 4 long questions spread across the remaining 5 pages. The total points on this exam is 100.

- Do not commence the exam until instructed to do so.
- Do not turn this page over until instructed to do so.
- You will have 3 hours to complete the exam.
- Answer the questions on the separate paper provided.
- Attempt 7 out of 10 short questions (70 points) and 2 out of 4 long questions (30 points). If you attempt more, be sure to indicate which you want us to grade or we will only grade the first ones that we come across.
- Be sure to show your workings.
- If part of a question builds on a previous part that you cannot answer, you may still get credit for describing how you would proceed were you to have the answer.
- You may be docked points for including irrelevant waffle in your answers.

Good luck!

Short questions (10 points each): Attempt 7 only

1. Give an example of a normal form game with a Nash equilibrium that is Pareto efficient and a normal form game with a Nash equilibrium that is Pareto inefficient. Be sure to write out the strategy/payoff matrix.

2. Consider a model in which rock stars have a demand for groupies to serve as their entourage, and groupies have a demand to hang out with rock stars. The demand by rock stars for groupies is $Q_G = 50 - P_G$ where $-\infty < P_G < \infty$. The demand by groupies for rock stars is $Q_R = 100 - P_R$ where $-\infty < P_R < \infty$. Groupies end up paying rock stars to be with them. True or false?

3. Wheat and oats are both types of grain. You are endowed with two pounds of wheat and four pounds of oats, and you only care about how many pounds of grain you have, not about whether it is wheat or oats. Assume that your transaction costs of buying and selling are zero, and that you have no other resources to exchange. Rank order your preferences over the following three relative prices of a pound of wheat vs. a pound of oats: 2/3, 1,3/2. (At 2/3, it means that the price of a pound of wheat is $2 and the price of a pound of oats is $3; therefore one pound of oats can be exchanged for 1.5 pounds of wheat.)

4. Mary's utility is given by square root of her wealth, as in $u(w) = \sqrt{w}$.
    a. What wealth-for-sure is the same to Mary as getting a 10% chance of 100, and a 90% chance of zero? [5 points]
    b. What chance of getting 25 (versus getting nothing) is worth the same as this? [5 points]

5. In his article "The Use of Knowledge in Society," Friedrich Hayek wrote: "Assume that somewhere in the world … one of the sources of supply of tin has been eliminated. … All that the users of tin need to know is that some of the tin they used to consume is now more profitably employed elsewhere, and that in consequence they must economize on tin." Hayek says that the collapse of a tin mine will have rippling effects throughout the system of markets. Explain how these ripples occur, how people are induced to change their behavior, and what some of those induced changes in behavior are.

6. Mary is preparing soup for dinner at home and discovers that she is in need of beef bullion. She must go to the grocery store to buy it. The only way is to take a taxi. Suppose that the following money expenditures are the only costs involved in obtaining the bullion:
   (1) She calls up the taxi company, and the phone call costs her 25 cents.
   (2) She pays the taxi a total of $8 to take her round-trip to and from the store (the taxi waits outside the store while she buys the bullion).
   (3) In the store she pays $2.50 for the beef bullion.
    a. How much are the transaction costs of buying the cab services? [3 points]
    b. How much are the transaction costs of buying the beef bullion? [3 points]
    c. With respect to which transaction is the 25 cents *not* a transaction cost? [4 points]

7. An author named Anne writes a book and enters a contract with a publisher. The contract says that Anne will receive royalties equaling X percent of total revenues from sales of the book. Explain in words why Anne's royalty payments might be higher if X equals 10 than if X equals 20.

8. Normal goods conform to the law of demand therefore inferior goods do not conform to the law of demand. True or false? Explain your answer.

9. Consider the following game in which payoff values X and Y are not yet specified

		Player 2	
		Left	Right
Player 1	Top	Y X	2 2
	Bottom	4 4	1 1

   a. State a combination of conditions, one on X and one on Y, such that the game would have **two** pure-strategy Nash equilibria. [7 points]
   b. State a combination of conditions, one on X and one on Y, such that the game would have **three** pure-strategy Nash equilibria. [3 points]

10. Suppose the following capabilities by Crusoe and Friday:
    Crusoe can: catch 2 fish per hour; gather 1 coconut per hour
    Friday can: catch 3 fish per hour; gather 2 coconuts per hour
    Each man has 80 hours (per week) to work. Simplifying assumptions:
    (1) Treat the goods as divisible and that fractions can be gathered/caught in proportions indicated above.
    (2) Also, assume that in doing an activity, the production is the only thing each cares about; that is, each finds fishing and coconut gathering equal in the pleasantness of the activity.
    a. Who has the comparative advantage in catching fish? [1 point for each part]
    b. When he lives in isolation, what is Friday's opportunity cost in terms of coconuts of catching one fish?
    c. Suppose the two men discover each other. They agree that they will trade at the following terms: Crusoe will give one fish to Friday for X coconuts. What must X be less than (or equal to)?
    d. When he lives in isolation, what is Crusoe's opportunity cost in terms of coconuts of catching one fish?
    e. What must X be greater than (or equal to)?
    f. Crusoe spends all his time in the activity where he as a comparative advantage. Crusoe and Friday jointly produce 280 fish and 80 coconuts. How many fish did Friday catch?
    g. How many coconuts did Friday gather?
    h. After completing their production and trading, Friday ends up with 160 fish and 56 coconuts. How many fish did Friday obtain from Crusoe?
    i. How many coconuts did Crusoe obtain from Friday?
    j. What is X?

Long questions (15 points each): Attempt 2 only

Question 1

Suppose you live in Colorado. Every winter there is a chance that your car will get caught on icy roads. In that event, having tire chains will enable you to drive. Assume that it costs $10 to carry tire chains around in your car for the winter, that it costs $200 more to be caught in an ice storm without car chains, and that you are risk neutral. Assume that you can get caught on icy roads no more than one time.

a. Suppose that in Colorado the average per year probability of being caught in an ice storm is 6%, should you bother to carry chains in your car? [3 points]
b. Your diving is confined to the area you live, which includes your regular commute to work. Ice storms are more common in some places in Colorado than in others. Weather experts have created a map distinguishing high risk versus low risk regions of the state. Two thirds of the state is low risk, and low risk regions have only a 3% annual chance of an ice storm. The remaining one third of the state is high risk, and high risk regions have a 12% annual chance of an ice storm. What is the maximum you would be willing to pay to get a copy of this ice storm risk map, in order to see whether your usual commute is in a high or low risk region? [12 points]

Question 2

Baron Manfred has a farm and a serf named Sparticus. The farm's output y depends on Sparticus' effort $0 \leq e \leq 1$. Output is $y = 2\sqrt{e}$. The cost to Sparticus of exerting effort is $c(e) = e$. Baron Manfred cannot directly observe Sparticus' effort. However he can credibly commit to keeping only a proportion $0 \leq \theta \leq 1$ of the farm's output after it has been produced, with the remaining $(1-\theta)y$ going to Sparticus. Sparticus chooses his effort after observing Baron Manfred's declared value of θ.

a. Given effort e and tax θ, what is Baron Manfred's payoff (in terms of output) and what is Sparticus' payoff (in terms of output minus cost of effort)? [2 points]
b. Find the subgame perfect Nash equilibrium choice of θ by Baron Manfred and the implied effort by Sparticus. [5 points]
c. Now consider the case in which $e = 1, \theta = 1$ and Baron Manfred pays a lump sum of L to Sparticus. State each person's payoff in terms of L. [1 point]
d. Show that the maximum lump sum payment that makes it beneficial for Baron Manfred to go from the outcome in (b) to the outcome in (c) is 1.5. [2 points]
e. Show that the smallest lump sum payment that makes it beneficial for Sparticus to go from the outcome in (b) to the outcome in (c) is 1.25. [2 points]
f. Can Baron Manfred and Sparticus make a deal in which Baron Manfred pays Sparticus L to deliver unto Baron Manfred some absolute amount of output T such that they both do better than in part (b)? If so, give an example of such a L and T. [3 points]

Question 3

Consider an economy with N identical people and 2 commodities: a private good and a public good. Each person i has a utility function $u(x_i, G)$ where x_i is i's consumption of the private good and G is i's consumption of the public good. Let g_i be the amount of the public good purchased by person i. Thus $G = \sum_{i=1}^{N} g_i$. Each person has an income m. The price of x_i is \$1, and the price of g_i is \$1. Let g_{-i} denote the amount of the public good provided by everyone except person i, that is $g_{-i} = G - g_i$. Each person's problem is therefore:

$$\max_{x_i, g_i} \{u(x_i, g_i + g_{-i}) \; s.t. \; x_i + g_i = m\}$$

a. Show that it is optimal for each person to choose (x_i, g_i) such that $\frac{\frac{\partial u}{\partial x}}{\frac{\partial u}{\partial G}} = 1$. [2 points]

A social planner solves the following problem:

$$\max_{x_1, \ldots, x_N, G} \left\{ \sum_{i=1}^{N} u(x_i, G) \; \; s.t. \left(\sum_{i=1}^{N} x_i \right) + G = Nm \right\}$$

b. Show that it is optimal for the planner to choose $(x_1, \ldots, x_N, G)$ such that $\frac{\frac{\partial u}{\partial x}}{\frac{\partial u}{\partial G}} = N$. [2 points]

The answer to (b) implies that when people make unilateral decentralized decisions, a socially sub-optimal amount of the public good is provided.

c. Intuitively, what is the reason that decentralized action results in a sub-optimal outcome? [3 points]

Suppose that the government taxes the private good $\$t$ per unit and subsidizes the public good $\$s$ per unit.

d. Show that when $t = (1 - s)N - 1$, then the new decentralized outcome is socially optimal. [5 points]

e. Now suppose that the model is merely a policymaker's description of some real-world situation. Of course, real-world situations are never as clean and simple as such a model. The policymaker proposes to impose a tax-and-subsidy scheme like the one that optimizes social utility in the model. Explain **three** possible ways that real-world factors either omitted from the model or misrepresented by the model might well upset the optimal functioning of the tax-and-subsidy scheme in the real world. [3 points]

Question 4

Consider an economy with one commodity x and with 2 people, 1 and 2. Both have an identical cardinal utility function $u(x) = \sqrt{x}$. Thus, if one of them consumes $x = 2$, his utility is 1.41. Let x_i be the amount of the commodity consumed by person i and let X be the total amount of the commodity there is to distribute in the economy.

a. Explain what is meant by ordinal and cardinal utility. [2 points]

The utility possibility frontier is defined as:

$$\{(u_1, u_2): u_1 = u(x_1), u_2 = u(x_2)\ for\ some\ (x_1, x_2)\ that\ satisfy\ x_1 + x_2 = X\}$$

In other words, it is the set of all possible pairs of utilities that result from allocating the X units of the commodity between the 2 people.

b. Sketch in a two-dimensional drawing the utility possibility frontier when $X = 4$. Be sure to label the axes and to give the coordinates of at least three points in the drawing. [2 points]
c. A Rawlsian social planner wants to maximize $W = \min(u_1, u_2)$. How much of the good will each person get under this social planner? Explain your answer. [3 points]
d. A utilitarian social planner wants to maximize $W = u_1 + u_2$. How much of the good will each person get under this social planner? Explain your answer. [3 points]
e. How would your answer to (d) change if person 1 has the utility function $2x$ and person 2 has the utility function? Explain your answer. [3 points]
f. Suppose the X starts out as endowments (e_1, e_2) of the individuals, i.e., $e_1 + e_2 = X$. Explain **two** possible disadvantages of charging the social planner with the task of determining a Pareto efficient allocation (x_1, x_2) of its choosing. [2 points]

End of exam