Micro Comp (second attempt) **Jan 28, 2010**

1 Part A: Short answer or explanation. 5 questions.

1. (Khanna) 1.Suppose Talia and Jose can produce jars of salsa and boxes of chocolates according to the following schedules:

Talia		Jose	
Salsa	Chocolates	Salsa	Chocolates
50	0	25	0
40	1	20	1
30	2	15	2
20	3	10	3
10	4	5	4
0	5	0	5

   Carefully write out (in a table) the production possibility frontier for this economy. Explain how you arrive at your answer.

2. (Pape) John spends $2000 on a new LCD television. Then, the television is stolen! John decides to buy a larger LCD television for $3000 to replace it. Is John irrational? If so, explain why. If not, explain what makes this behavior rational.

3. (Pape) Suppose there are two production sets, which convert an input x into an output y and are irreversible. Suppose the first production set exhibits decreasing returns to scale. Suppose the second exhibits constant returns to scale.

   Now consider a third production set, which is constructed by allocating any amount of x input between the two production sets described earlier. What are the returns to scale of this new production set? (And why.)

4. (Pape) Consider some choice set X with more than three elements. Show that rational preferences over X satisfy independence of irrelevant alternatives.

5. (Pape) A natural monopoly occurs when there are high fixed costs and low marginal costs. The marginal costs of producing digital music files is virtually zero, while the fixed cost of the first recording is quite high. Does this mean that the music industry is a natural monopoly? Why or why not?

2 Part B: Mathematical or advanced questions. 5 questions.

6. (Khanna) Suppose there are two oil refineries in the Los Angeles basin that distill crude oil to make gasoline and other derivatives. Because refining is a highly polluting process, the California government steps in and requires each refinery to reduce its pollution by 100 lbs so that the total pollution in the LA basin is reduced by 200 lbs.

    (a) As an economist, would you agree or disagree with this policy of equal absolute reduction in pollution by both refineries? Support your answer with a diagrammatic analysis.

    (b) If you disagree with the current pollution reduction policy, how would you decide how much pollution each refinery should reduce?

7. (Khanna) Your municipal government is considering building an office building next to your house. Two economists propose different approaches to evaluating your loss of daylight. Economist A says, How much would you pay us not to build? Economist B says, How much would we have to give you before you would agree to the building?

    (a) How will you arrive at your answer to the two questions? Explain clearly using a diagram.

    (b) Which question will produce a bigger answer, and why?

8. (Pape) Consider a game in which the following simultaneous-move game is played twice:

	b_1	b_2	b_3
a_1	10, 10	2, 12	0, 13
a_2	12, 2	5, 5	0, 0
a_3	13, 0	0, 0	1, 1

    The players observe the actions chosen in the first play of the game prior to the second play. Describe one subgame perfect Nash equilibrium in which (a_1, b_1) is played in the first round, or explain why no such SPNE exists.

9. (Pape) Consider an economy with three goods: money m, x-ray machines x, and radio airtime r. Suppose there are 100 agents, who all have the following utility function:

$$u_i(m, x, r) = m + \ln(x) + \frac{1}{50}r \tag{1}$$

    Suppose there is a single firm which can produce x-ray machines at a constant marginal cost c. Also suppose that there is a central taxing authority, which can convert money into radio airtime at a constant marginal cost of 1. Suppose the central taxing authority can only raise money by adding a per-unit tax τ on x.

    What is the socially optimal level of tax $\tau^\star$? (You can assume that the economy will be Walrasian equilibrium.)

10. (Pape) Suppose a firm produces computer chips y with a cost function $c(y)$, which has increasing marginal costs. Of the chips that are produced, a fraction $1 - \alpha$ are defective and cannot be sold. Working chips can be sold at a price p and the chip market is competitive.

    (a) Calculate the derivative of profits with respect to α and its sign.

    (b) Calculate the derivative of output with respect to α and its sign.

3   Part C: Longer questions. Answer BOTH questions.

11. (Pape) **Socks.** Consider an economy with socks of different colors. There are three colors of socks: **b**lue, **y**ellow, and **r**ed. There are four agents, numbered 1 through 4. Suppose m_i is the *money* belonging to agent i and s_i is the set of socks belonging to agent i. Then the utility of agent i is:

$$u_i(m_i, s_i) = m_i + \theta_i g(s_i) \qquad (2)$$
$$\text{where } \theta_i = i - 1 \qquad (3)$$

$$\text{and } g(s_i) = \begin{cases} 2, & \text{if } s_i \text{ contains at least one matching pair of socks} \\ 1, & \text{if } s_i \text{ contains at least two socks, but none match} \\ 0, & \text{otherwise (i.e. one or zero socks)} \end{cases} \qquad (4)$$

Suppose agents 2, 3, and 4 each have an allocation of 100 units of money and zero socks. Suppose agent 1 has an allocation of 0 units of money, and the following socks: two red socks, three yellow socks, and one blue sock.

   (a) List all pareto optimal allocations of socks AND defend your claim that these are, in fact, P.O. and that there are no other P.O. allocations.

   (b) List all Walrasian equilibria of this economy AND defend your claim that these are, in fact, all Walrasian eq'a and that there are no other Walrasian eq'a.

   (c) Suppose agent 1 found an additional blue sock. List all Walrasian equilibria of this new economy AND defend your claim that these are, in fact, all Walrasian eq'a and that there are no other Walrasian eq'a.

12. (Pape) Suppose there is a single firm and single consumer. The firm's product can either be **h**igh or **l**ow quality, and is of high quality with probability λ. The consumer cannot observe quality before purchase and is risk-neutral. The consumer's valuation of a high-quality product is v_H; her valuation of a low-quality product is v_L. The costs of production for the good are c_H and c_L, for high and low quality. Suppose the firm's price is set by regulation to p. Suppose:

$$v_H > p > v_L > c_H > c_L \qquad (5)$$

   (a) Given p, when will the consumer buy the product?

   (b) Suppose before the consumer decides whether to buy, the firm, which knows the quality of the good, can advertise. Advertising does not convey information directly, but the consumer can observe the amount of money A which the firm spends on advertising. Is there an equilibrium in which the amount of advertising is informative of the quality of the product? Why or why not?