個體經濟學期末考 (2014.6) 古慧雯

總分30分。答題皆須附說明, 未做解釋的答案概不計分。

1. Suppose each person has the same wealth w. When falling ill, a person has to pay a medical expense m, and his wealth becomes $w - m$. Let x and y denote the wealth of a person when he is ill, and when he is healthy. There are two types of persons. A type a person has a utility function:

$$u_a = xy^4;$$

and a type b person has a utility function:

$$u_b = x^4y.$$

The insurance companies are all risk-neutral and the insurance market is competitive so in equilibrium each company's expected profit is zero. (There is no administration cost.)

   (a) (2 points) What is the probability that a type a person will fall ill.

   (b) In equilibrium, there occur two different insurance policies. A type b person purchases a full insurance, i.e. the insurance company will cover all his medical expense, while a type a person purchases a partial insurance, i.e. the insurance company only pays for part of the medical expense. Please answer the following questions in terms of w and m.

      i. (2 points) What is the insurance fee for the full insurance?

      ii. (4 points) After purchasing the partial insurance, what is a type a person's wealth x? Please list the equation(s) that you need to solve for this x without solving them numerically.

2. Four people live together. Each person consumes firewood and banana. While banana is a private good, firewood is a public good because all of them could enjoy the warmth when firewood is burned. They will go out to collect firewood and banana each day. Let W_i and B_i denote the quantity of firewood and banana that i collects in a day. The production possibility curve is:

$$2W_i + B_i = 10, \quad i = 1, 2, 3, 4.$$

On the other hand, the utility function of i is:

$$U_i = WB_i^3, \quad i = 1, 2, 3, 4,$$

where $W = \sum_{i=1}^{4} W_i$.

(a) (1 point) What is the opportunity cost of collecting a piece of firewood?

(b) (1 point) If a person's current consumption bundle is 1 banana and 5 pieces of firewood, what is his marginal willingness to pay for one more piece of firewood?

(c) (2 point) What is the efficient quantity of firewood to collect in a day?

3. Reconsider the story of the aquarium in the textbook. Citizens could either spend a holiday picnicking in the large city park which never gets crowded, or visiting the aquarium. The value to pay a visit to the aquarium depends on the size of visitors, n, and each visitor receives the same value of $AV(n) = 120 - n$. Citizens value picnic in the park differently, and if we sort their values from low to high, the n-th person's value of picnic is $2n$.

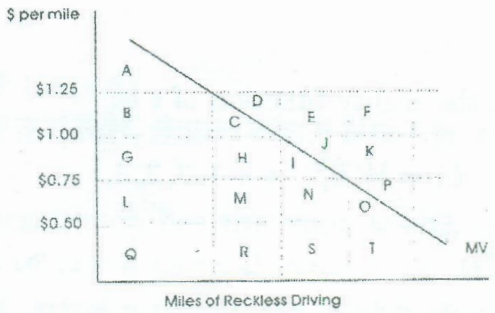
(a) (2 points) If the aquarium is open to the public free, how many citizens will visit the aquarium in equilibrium?

(b) (2 points) To achieve efficiency, who should be arranged to visit the aquarium?

(c) (2 points) If the visitor has to purchase a ticket to enter the aquarium, what is the demand function for the tickets?

(d) (2 points) How much should be the ticket charged to achieve efficiency?

4. Suppose the reckless driving imposes costs (in the form of medical bills) on both the drivers themselves and on pedestrians. Each mile of reckless driving costs drivers \$1 and pedestrians \$0.25. The marginal value of a driver of his/her reckless driving is indicated by the downward-sloping curve in the following figure. The drivers are not responsible for pedestrians' losses. Answer the following questions in terms of labeled areas on the graph.



(a) (2 points) What is the social gain from a driver's reckless driving?

(b) Suppose drivers can acquire air bags that reduce the cost to them of their reckless driving from \$1 per mile to \$0.5 per mile. The cost to pedestrians remains \$0.25 per mile, regardless of whether drivers use air bags.

i. (2 points) What is the maximum price, p_{max} that a driver is willing to pay for an air bag?

ii. (2 points) The market of air bags are competitive and an air bag is sold at its cost c_{bag}, and $c_{bag} < p_{max}$. How much would you like to tax an air bag to make the transaction efficient, i.e. sales of air bags imply an increase in the social gain?

5. There are 100 ton crops remaining for the supply of two months. The crop holders consider whether to sell crops now or to sell them one month later. Let p_1 and p_2 denote the (spot) prices of the crop of this month and next month. The monthly demand of this month is:

$$q_1 = 150 - p_1;$$

and the monthly demand of next month is:

$$q_2 = 160 - p_2.$$

The monthly interest rate is 10%.

(a) (2 points) In equilibrium, what is the price of this month?

(b) (2 points) What is the equilibrium *futures* price for a ton of crop delivered next month?

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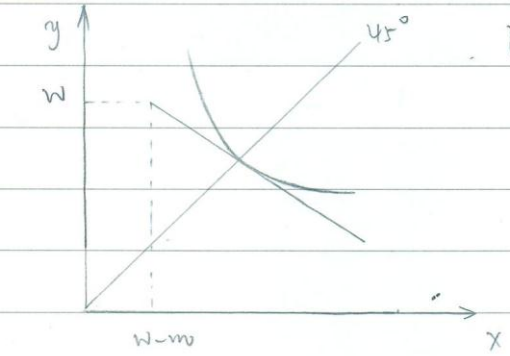
1.

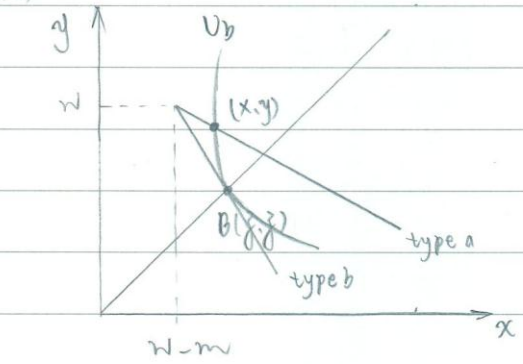
(a)



$MRS_A = \frac{y}{4x}$

$\frac{-p}{1-p} = -\frac{1}{4} \Rightarrow p = \frac{1}{5}$

(b)



(i) $\frac{4}{5}m$

(ii) $\frac{1}{5}x + \frac{4}{5}y = \frac{1}{5}(w-m) + \frac{4}{5}w$ — ①

(x,y) 通過B點的無異曲線

$\Rightarrow x^4 y = \beta^5$ — ②

2.

(a) $MRT = 2$

(b) $MRS_{i}\big|_{B_i=1,\, w=5} = \frac{B_i}{3w}\big|_{B_i=1,\, w=5} = \frac{1}{15}$

(c) $MRS_1 + MRS_2 + MRS_3 + MRS_4 = MRT$

$\Rightarrow \frac{B_1+B_2+B_3+B_4}{3w} = 2$

$\Rightarrow 40 - 2w = 6w \quad \therefore w = 5$

3.

(a) $120 - n = 2n \quad \therefore n = 40$

(b) $MV(n) = 120 - 2n = 2n \quad \therefore n = 30$

(c) $p = 120 - n - 2n \Rightarrow n = 40 - \frac{p}{3}$

(d) $n = 30$ 時, $p = 30$

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4.

(a) private gain A+B+C

−) externalities B+C+D

social gain A−D

(b)

(i) 原 private gain A+B+C

後 private gain $A+B+C+\underbrace{G+H+I+J+M+N+O}_{P_{max}}$

(ii) N+O+P (多了安全氣囊令開快車所造成的外部性)

5.

(a) $P_1 \times 1.1 = P_2$

$(150 - P_1) + (160 - P_1 \cdot 1.1) = 100$

$\therefore P_1 = 100$

(b) 等於 $P_2 = 110$