※ 考生請注意：本試題 □可 ☑不可 使用計算機

1. Marie's Utility function is $U(x, y) = \min\{3x + 2y, 2x + 5y\}$, where x is the number of units of sugar she consumes and y is the number of units of spice she consumes. She is currently consuming 12 units of sugar and 40 units of spice and she is spending all of her income.

   (a) Draw a graph showing her indifference curve through this point. 【10%】

   (b) The price of spice is $1. In order for this to be her consumption bundle, what must the price of sugar be and what must her income be? 【10%】

2. Two firms in a grimy Ohio town produce the same product in a competitive industry. Each has an old factory using an old technology. It still pays to operate these factories but it would not pay to expand them. The only variable factor used by either firm is labor. Each firm pollutes the other and thus reduces the output of the other firm. The production functions of firm A and B respectively are

   $$Q_a = L_a^{0.5} - (2/3) \cdot Q_b \quad \text{and} \quad Q_b = L_b^{0.5} - (1/3) \cdot Q_a,$$ where $L_a^{0.5}$ and $L_b^{0.5}$ are the

   square roots respectively of the amount of labor used by firms A and B. The wage rate of labor is $1 and the price of the firms' output is $12.

   (a) If the two firms each maximize profits independently, what is their total output and how much quasi-rents do their factories earn? 【10%】

   (b) If someone buys them both and maximizes joint profits, how much quasi-rent is earned in total? 【10%】

3. Consider an economy with two agents and two goods. Let the goods be labeled x and y, and the agents 1 and 2. Agent 1's initial endowment is given by the vector (3/4, 1/4). Agent2's endowment vector is given by the vector (1/4, 3/4). Thus, there is a total endowment of 1 unit of x and 1 unit of y. The preference of the two agents are represented by the utility functions:

   $$U(x, y) = x + 2y$$
   $$U(x, y) = \min\{x, y\}$$

   (a) Draw the Edgeworth box. Label the endowment point by E. 【5%】

   (b) Draw the indifference curve for each agent through the endowment point. 【5%】

   (c) Determine the competitive equilibrium allocation. 【5%】

   (d) Find the equation for the contract curve. 【5%】

(背面仍有題目,請繼續作答)

※ 考生請注意：本試題 □可 ☑不可 使用計算機

4. Which of the following functions are homothetic? Give a reason for each answer.

   (a) $e^{x^2y}e^{xy^2}$ 【5%】 (b) $2\log x + 3\log y$ 【5%】 (c) $\dfrac{x^2y^2}{(xy+1)}$ 【5%】 (d) $x^2y + xy$ 【5%】

5. A duopoly faces the demand curve $D(p) = 30 - 0.5p$. Both firms in the industry have a total cost function given by $C(q) = 4q$. Suppose that firm 1 is a Stackelberg leader in choosing its quantity first. Then, what is firm 1's profit function? 【10%】

6. A monopolist sells in two markets. The demand curve for her product is given by $p_1 = 122 - 2x_1$ in the first market and $p_2 = 306 - 5x_2$ in the second market, where x_i is the market i and p_i is the price charged in market i. She has a constant marginal cost of production, $c = 6$, and no fixed costs. What is the profit-maximizing combination of quantities for this monopolist? (find x_1 and x_2) 【10%】