本試題是否可以使用計算機：☑可使用　，□不可使用　（請命題老師勾選）

1. The demand function for coffee is given by

$$D_c = 100 - 2p_c + 0.5p_t$$

and that for tea is given by

$$D_t = 120 - p_t + 0.75p_c$$

where p_c is the price for coffee and p_t is the price for tea. The respective supply functions are

$$S_c = 10 + p_c + 5w_c$$
$$S_t = 5 + 2p_t + 2w_t$$

where w_t and w_c are the indexes of weather conditions affecting production of tea and coffee respectively. Give the comparative-statics effects on equilibrium prices of changes in the weather conditions variables (find $\partial p_c / \partial w_c$, $\partial p_t / \partial w_c$, $\partial p_t / \partial w_t$ and $\partial p_c / \partial w_t$). 【10%】

2. Consider the costs and benefits of a college education. A college graduate can expect an income of M_c per year in comparison to M_{nc} for someone who is not a college graduate. If this amount is received every year over a working life of T years, the present value of a college education (taken from the year of graduation) is

$$PV = \sum_{t=1}^{\infty} (M_c - M_{nc})(1+i)^{-t}$$

This present value can be simplified by letting $T \to \infty$ (which is a good estimate for large T) by

$$PV = \frac{M_c - M_{nc}}{i}.$$

Now consider the costs of a college education (also computed in graduation-year dollars). There are both explicit costs (tuition, books, etc.) and implicit costs (forgone income) associated with 4 years of college. Viewed from the graduation year, the implicit cost of college is

$$M_{nc}(1+i)^3 + M_{nc}(1+i)^2 + M_{nc}(1+i) + M_{nc}$$

and the explicit cost is

$$C_x(1+i)^3 + C_x(1+i)^2 + C_x(1+i) + C_x$$

where C_x is the total explicit cost of college per year.

Using this information, compute how much a student would need to make after graduation M_c^* to break even on college when i=8%, M_{nc} =\$40,000, and C_x=\$23,000. 【5%】

（背面仍有題目，請繼續作答）

3. The cost function $c(w_1, w_2, y)$ of a firm gives the cost of producing y units of output when the wage of factor 1 is w_1 and the wage of factor 2 is w_2. Find the cost functions for the following firms:

a. A firm with production function $f(x_1, x_2) = \min\{2x_1, 3x_2\}$ 【5%】
b. A firm with production function $f(x_1, x_2) = 2x_1 + 3x_2$ 【5%】
c. A firm with production function $f(x_1, x_2) = \max\{2x_1, 3x_2\}$ 【5%】

4. An economy has 2,000 people. 1,000 of them have utility function $U(x, y) = x + y$ and 1,000 of them have utility function $U(x, y) = \min\{2x, y\}$. Everybody has an initial allocation of 1 unit of x and 1 unit of y. Find the competitive equilibrium prices and consumptions for each type of person. 【10%】

5. An airport is located next to a housing development. Where X is the number of planes that land per day and Y is the number of houses in the housing development, profits of the airport are $36X - X^2$ and profits of the developer are $42Y - Y^2 - XY$. Let H_1 be the number of houses built if a single profit-maximizing company owns the airport and the housing development. Let H_2 be the number of houses built if the airport and the housing development are operated independently and the airport has to pay the developer the total "damages" XY done by the planes to the profits of the developer. What are the values of H_1 and H_2? 【10%】

6. Tom is trying to decide whether to have 0 cars, 1 car, or 2 cars. If x is the number of cars he has and y is the amount of money he has per year to spend on other stuff,

Tom's utility function is $U(x, y)$, where $U(0, y) = y^{1/2}$,

$U(1, y) = (15/14) \cdot y^{1/2}$, $U(2, y) = (10/9) \cdot y^{1/2}$. Suppose that it costs \$2,000 a year to have 1 car and \$4,000 a year to have 2 cars. Tom finds that the right thing to do depends on his income.

a. What is his willingness to pay for 1 car if his income is M? 【5%】
b. What is the lowest income at which he would have a car? 【5%】
c. What is the lowest income at which he would have 2 cars? 【5%】

7. The certainty equivalent of a gamble is defined to be the amount of money which, if you were promised it with certainty, would be indifferent to the gamble. If an expected utility maximizer has a von Neuman-Morgenstern utility

function $U(W) = W^{1/2}$ (where W is wealth) and if the probability of event 1 and 2 are both 1/2, write a formula for the certainty equivalent of a gamble that gives you x if event 1 happens and y if event 2 happens. 【5%】

8. Peter has the utility function $U(x, y) = \frac{y}{100 - x}$

a. Does Peter prefer more to less of both goods? 【5%】

b. Draw a diagram showing Peter's indifference curves corresponding to the utility levels $U = 1/2$, and $U = 2$ 【5%】

c. How can you describe the set of indifference curves for Peter? 【5%】

d. If the price of x is \$1 and the price of y is \$1, find Peter's demand for x as a function of his income and draw a diagram showing his Engel curve for x. 【5%】

9. A natural monopolist has the total cost function $c(q) = 350 + 20q$, where q is its output. The inverse demand function for the monopolist's product is $p = 100 - 2q$. Government regulations require this firm to produce a positive amount and to set price equal to average costs. What amount will this firm produce to comply with these requirements? 【10%】