Last Name (Please PRINT): ....

First Name (PRINT): ....

Your UM I.D. Number: ....

INSTRUCTIONS (please read!)

1. Please make sure that you have 10 pages, including this page. Complaints about missing pages will not be accepted.

2. Please answer all the questions. You are <u>not</u> allowed to use any course material. Calculators are permitted.

3. Maximum Time Allowed: 2 hours (8:00–10:00).

4. Your grade depends on the arguments you develop for supporting your answers. Each answer must be justified by using a logical argument consisting of a model/graph. An answer with no justification will not be given any credit.

5. You must provide all the derivations leading you to a numerical solution.

6. When you draw a graph, make sure that you label the axes with the appropriate notation.

7. Maximum Score: 100 Points

8. Budget your time. If you cannot answer a certain question, skip to the next one.

9. Please always bear in mind that "somebody" has to read and understand your handwriting. Please make sure that your ink is "visible" and that your sentences are properly organized and fit into the designated blank space. If you think that your handwriting is poor, please print each word!

10. # Good Luck !

Instructor's use only

Problem #	1	2	3	4	5	6	Total
Maximum Points	10	20	15	30	10	15	100

(1a) [5 points]   State Leontief's Paradox. Make sure that you explain which theorem was tested by Leontief.

(1b) [5 points]   Discuss at least three explanations that were given to this paradox over the years. Discuss how these explanations reconcile the paradox with the theorem that was tested by Leontief.

(2) A country trades and produces two goods: Financial services (F) and cars (C). The international price of a financial service is denoted by p_F. The international price of a car is denoted by and p_C.

Financial services are produced with capital and specific labor (labor skilled in producing F only which cannot be employed in the car industry).

Cars are produced with capital and specific labor (labor skilled in producing C only which cannot be employed in the financial sector).

Let K_F denote the amount of capital employed by the financial sector and K_C the amount of capital employed in the car industry. The country is endowed with $\bar{K}$ units of capital, so full employment of capital implies $K_F + K_C = \bar{K}$.

The country is endowed with $\bar{L}_F$ units F-specific labor and with $\bar{L}_C$ units of C-specific labor.

Let w_F denote the wage rate paid to workers in the financial sector and w_C denote the wage rate paid by the car industry to C-specific labor. The rental on the mobile factor, capital, is denoted by R.

Suppose now that it becomes clear that free trade leads to a 10% reduction in the price of cars (p_C declines). Solve the following problems:

(2a) [5 points] Using a graph of the capital market analyze how the decline in p_C affects the amount of capital employed in each industry (K_F and K_C).

(2b) [5 points] Analyze how the reduction in p_C affects the nominal rent on capital R, and the real rents, R/p_F and R/p_C. Will capital owners lobby for or against free trade.

(2c) [5 points] Analyze how the reduction in p_C affects the nominal wage rate in the car industry, w_C, as well as the real wages w_C/p_F and w_C/p_C. Will automobile labor union lobby for or against free trade?

(2d) [5 points] Analyze how the reduction in p_C affects the nominal wage rate in the financial sector, w_F, as well as the real wages w_F/p_F and w_F/p_C. Will workers in the financial sector lobby for or against free trade?

(3) Consider a single autarkic economy with $L = 2400$ units of labor which is the sole input in production. All consumers have a CES utility function given by
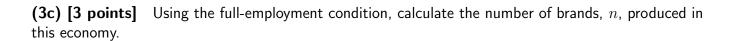
$$U(q_1, q_2, \ldots, q_n) \equiv \sum_{i=1}^{n} (q_i)^{\frac{1}{2}} = \sum_{i=1}^{n} \sqrt{q_i},$$

where q_i is the consumption level of brand i, $i = 1, 2, \ldots, n$.

Each brand is produced by a single firm under an IRS production technology. Each firm incurs a fixed cost of $F = 120$ and in addition, a cost of $c = 2$ per unit produced. That is, the total cost of brand i producing firm is $TC_i(q_i) = 120 + 2q_i$. Solve the following problems:

(3a) [3 points] Given that firm i is a monopoly on brand i, write down the firm's profit maximizing first-order condition (marginal revenue equals marginal cost) and conclude what price will be charged by the firm, p_i.

(3b) [3 points] Using the freedom of entry and exit condition (also known as the zero-profit condition), calculate the output level of each firm, q_i.

(3c) [3 points] Using the full-employment condition, calculate the number of brands, n, produced in this economy.

(3d) [3 points] Calculate the country's utility level under *autarky*.

(3e) [3 points] Suppose now that there is free trade among 3 countries, each is identical to the economy described above. Calculate the utility level of each country under *free trade*.

(4) Chewata (a small country) can import chewing gum at a given world price of $p_W = 30$ per package. The domestic inverse demand function for chewing gum packages is $p = 120 - y^d$.

In Chewata there is one producer of chewing gum whose inverse supply function is given by $p = 80 + y^s$. Solve the following problems.

(4a) [10 points] Let t_s denote the specific import tariff imposed on imported chewing gum.
(i) Compute the tariff level which maximizes government's revenue. (ii) Compute the amount of revenue the government collects under this tariff.

(4b) [10 points] Instead of levying an import tariff the government decided to impose an import quota of $\bar{I} = 20$ packages. Compute the equilibrium domestic price and the revenue collected by the government from selling 20 import licenses.

(4c) [10 points] Suppose now that the government abolishes all import tariffs and quotas. Instead, the government subsidizes domestic production by paying domestic producers a specific subsidy of $s = \$70$ per unit produced. Compute (i) the number units produced by domestic firms under this subsidy, (ii) how many units are imported, and (iii) compute the total subsidy cost borne by the government.

(5) [10 points]   Each American made car is produced with three imported components: 1000 lbs. of steel, 1000 lbs. of plastic, and 100 lbs. of rubber. Steel is imported from Korea at the price of $2 per lb., plastic is imported at a price of $1 per lb., and rubber is imported from Italy at a price of $5 per lb.. Suppose that imported cars are perfect substitutes to American cars and that the free-trade price of each car is $20,000.

Compute the effective rate of protection on the U.S. car industry assuming that the U.S. government levies an ad-valorem tariff of $t_S = t_P = t_R = 40\%$ uniformly on all imported factors of production and a tariff of $t_C = 50\%$ on imported cars.

(6) [15 points] Consider a world with three freely-trading countries A, B, and C and two goods X and Y. Each good is produced using labor only. Countries A, B, and C are endowed with $L^A = 100$, $L^B = 200$, and $L^C = 300$ units of labor, respectively. The following matrix provides the amount of labor needed to produced one unit of each good in each country:

	X	Y
A	5	1
B	4	4
C	2	5

Suppose that all consumers have the same preferences, and that they view both goods as perfect complements. Hence, they will always consume one unit of X for every one unit of Y. Formally let $U(x, y) \overset{\text{def}}{=} \min\{x, y\}$.

Assuming that labor is freely mobile among the three countries, compute the amount of labor that immigrates to/from each country. Prove your result!

THE END