SPRING 1998 **EXERCISE I** **Dr. S. C. AHN**

1. (30 pts.) Answer the following questions. (5 pts. each)

(a) Given A = {a,b,c,d}, B = {b,c,d}, C = {b,c,d,e}, find (A - B) $\cup$ C.
(b) Given A = {1,2,3,5}, B = {2,3,4}, is it true that {2,5} $\subset$ A $\cap$ B? Why or why not?
(c) Given S_1={a,b} and S_2={c}, find the Cartesian product, $S_1 \times S_2$, and all of its subsets.
(d) Let X = {a,b} and Y = {1,2}. A relation from X to Y is defined by R = {(a,1),(b,1),(a,2)}. Is R a function from X to Y? Why or why not? Explain it.
(e) Find the equilibrium price for the model:
$Q_d = 8 - P^2$
$Q_s = P^2 - 2$.
(f) Consider the following supply functions:
$Q_s = c + dP$.
Determine the signs of c and d. Explain briefly why.

2. (20 pts.) Answer the following questions. (10 pts. each)

(a) Using a Venn diagram, show that $(A \cup B)^c = A^c \cap B^c$.
(b) Given the following matrices, find $(AB)^t$:

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}; \; B = \begin{bmatrix} 1 & 1 \\ 0 & 2 \\ 1 & 1 \end{bmatrix}.$$

3. (30 pts) Answer the following questions. [5 pts for (a)-(d) and 10 pts for (e)]

$$A = \begin{bmatrix} 1 & 1 \\ 2 & 3 \end{bmatrix}; \; B = \begin{bmatrix} 1 & 1 & 0 \\ 2 & 3 & 0 \\ 0 & 0 & 10 \end{bmatrix}.$$

(a) Find the inverse A.
(b) Find the determinant of B.
(c) Find the inverse of B.
(d) Find the cofactor of 2 in B.
(e) Find the determinant of $C = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 2 & 3 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 2 & 3 \end{bmatrix}$.

4. (20 pts.) Consider the following national-income model:

$$Y = C + I_o + G_o$$
$$C = a + b(Y - T),\ a > 0,\ \ 0 < b < 1$$
$$T = t_c C + (1-t_c)Y,\ \ 0 < t_c < 1.$$

Here the subscript "o" means "exogenous." The fractions t_c and $(1-t_c)$ are consumption and income tax rates, respectively. (Here, we are assuming that the sum of two tax rates equals one.) The tax rate t_c is also exogenous.

(a) Using Cramer's rule, find $\bar{C}$ and $\bar{T}$. (15 pts.)

(b) Assuming $I_o = G_o$, $a = 0$ and $b = 0.5$. Find t_c by which the government's budget is balanced. (5 pts.)