Homework Day 1 - ECON 186

Problem 1. Chiang and Wainwright 2.3 #3, 5

#3 Let $S_1 = \{2, 4, 6\}$, $S_2 = \{7, 2, 6\}$, $S_3 = \{4, 2, 6\}$, $S_4 = \{2, 4\}$), find:
(a)$S_1 \cup S_2$ (c) $S_2 \cap S_3$ (e)$S_4 \cap S_2 \cap S_1$
(b)$S_1 \cup S_3$ (d)$S_2 \cap S_4$ (f)$S_3 \cup S_1 \cup S_4$
#5 Given $A = \{4, 5, 6\}$, $B = \{3, 4, 6, 7\}$, and$C = \{2, 3, 6\}$, verify the distributive law.

Problem 2. Chiang and Wainwright 2.4 #1, 6, 7

#1 Given $S_1 = \{3, 6, 9\}$, $S_2 = \{a, b\}$, and $S_3 = \{m, n\}$, find the Cartesian products:
(a)$S_1 \times S_2$ (b)$S_2 \times S_3$ (c)$S_3 \times S_1$
#6 For the function $y = -x^2$, if the domain is the set of all nonnegative real numbers, what will its range be?
#7 In the theory of the firm, economists consider the total cost C to be a function of the output level Q:C=f(Q).
(a) According to the definition of a function, should each cost figure be associated with a unique level of output?
(b) Should each level of output determine a unique cost figure?

Problem 3. Chiang and Wainwright 3.2 #2

#2 Let the demand and supply functions be as follows:
(a) $\begin{cases} Q_d &= 51 - 3P \\ Q_s &= 6P - 10 \end{cases}$ (b) $\begin{cases} Q_d &= 30 - 2P \\ Q_s &= -6 + 5P \end{cases}$
find P^* and Q^* by elimination of variables. (Use fractions rather than decimals.)

Problem 4. Chiang and Wainwright 3.3 #6

#6 Find the equilibrium solution for each of the following models:
(a) $\begin{cases} Q_d = & Q_s \\ Q_d = & 3 - P^2 \\ Q_s = & 6P - 4 \end{cases}$ (b) $\begin{cases} Q_d = & Q_s \\ Q_d = & 8 - P^2 \\ Q_s = & P^2 - 2 \end{cases}$

Problem 5. Chiang and Wainwright 4.1 #1, 2

(Model 3.1)
$Q_d = Q_s \qquad Q_d = a - bP \qquad Q_s = -c + dP \qquad (a, b, c, d > 0)$
(Model 3.12)
$Q_{d1} - Q_{s1} = 0$
$Q_{d1} = a_0 + a_1 P_1 + a_2 P_2$
$Q_{s1} = b_0 + b_1 P_1 + b_2 P_2$
$Q_{d2} - Q_{s2} = 0$
$Q_{d2} = \alpha_0 + \alpha_1 P_1 + \alpha_2 P_2$
$Q_{s2} = \beta_0 + \beta_1 P_1 + \beta_2 P_2$
(Model 4.1)
$a_{11}x_1 + a_{12}x_2 + ... + a_{1n}x_n = d_1$
$a_{21}x_1 + a_{22}x_2 + ... + a_{2n}x_n = d_2$
.....
$a_{m1}x_1 + a_{m2}x_2 + ... + a_{mn}x_n = d_m$
#1 Rewrite the market model (3.1) in the format of (4.1), and show that, if the three variables are arranged in the order Q_d, Q_s, and P, the coefficient matrix will be

$$\begin{bmatrix} 1 & -1 & 0 \\ 1 & 0 & b \\ 0 & 1 & -d \end{bmatrix}$$

How would you write the vector of constants?
#2 Rewrite the market model (3.12) in the format of (4.1) with the variables arranged in the following order: Q_{d1}, Q_{s1}, Q_{d2}, Q_{s2}, P_1, P_2. Write out the coefficient matrix, the variable vector, and the constant vector.