Homework Day 1 Solutions - ECON 186

Problem 1. Chiang and Wainwright 2.3 #3, 5

3)

a) $\{2, 4, 6, 7\}$

b) $\{2, 4, 6\}$

c) $\{2, 6\}$

d) $\{2\}$

e) $\{2\}$

f) $\{2, 4, 6\}$

5) First part: $A \cup (B \cap C) = \{4, 5, 6\} \cup \{3, 6\} = \{3, 4, 5, 6\}\,;$ *and* $(A \cup B) \cap (A \cup C) = \{3, 4, 5, 6, 7\} \cap \{2, 3, 4, 5, 6\} = \{3, 4, 5, 6\}$ *too.*

Second part: $A \cap (B \cup C) = \{4, 5, 6\} \cap \{2, 3, 4, 6, 7\} = \{4, 6\}\,;$ *and* $(A \cap B) \cup (A \cap C) = \{4, 6\} \cup \{6\} = \{4, 6\}$ *too.*

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

1)

a) $\{(3, a), (3, b), (6, a), (6, b), (9, a), (9, b)\}$

b) $\{(a, m), (a, n), (b, m), (b, n)\}$

c) $\{(m, 3), (m, 6), (m, 9), (n, 3), (n, 6), (n, 9)\}$

6) The range is the set of all nonpositive numbers.

7)

a) No
b) Yes

Problem 3. Chiang and Wainwright 3.2 #2

2)

a) $P^* = \frac{61}{9}, Q^* = \frac{276}{9}$

b) $P^* = \frac{36}{7}, Q^* = \frac{138}{7}$

Problem 4. Chiang and Wainwright 3.3 #6

6)

a) The model reduces to $P^2 + 6P - 7 = 0$. By the quadratic formula, we have $P_1^* = 1$ and $P_2^* = 7$, but only the first root is acceptable. Substituting that root into the second or the third equation, we find $Q^* = 2$.

b) The model reduces to $2P^2 - 10 = 0$ or $P^2 = 5$ with the two roots $P_1^* = \sqrt{5}$ and $P_2^* = -\sqrt{5}$. Only the first root is admissible, and it yields $Q^* = 3$.

Problem 5. Chiang and Wainwright 4.1 #1, 2

1.

$$\begin{aligned} Q_d \quad -Q_s \quad\quad\quad &= 0 \\ Q_d \quad\quad\quad +bP &= a \\ Q_s \quad -dP &= -c \end{aligned}$$

Coefficient Matrix:

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

Vector of Constants:

$$\begin{bmatrix} 0 \\ a \\ -c \end{bmatrix}$$

2.

$$
\begin{array}{llllllll}
Q_{d1} & -Q_{s1} & & & & & = 0 \\
Q_{d1} & & & & -a_1 P_1 & -a_2 P_2 & = a_0 \\
& Q_{s1} & & & -b_1 P_1 & -b_2 P_2 & = b_0 \\
& & Q_{d2} & -Q_{s2} & & & = 0 \\
& & Q_{d2} & & -\alpha_1 P_1 & -\alpha_2 P_2 & = \alpha_0 \\
& & & Q_{s2} & -\beta_1 P_1 & -\beta_2 P_2 & = \beta_0
\end{array}
$$

Coefficient matrix: Variable vector: Constant vector:

$$
\begin{bmatrix}
1 & -1 & 0 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & -a_1 & -a_2 \\
0 & 1 & 0 & 0 & -b_1 & -b_2 \\
0 & 0 & 1 & -1 & 0 & 0 \\
0 & 0 & 1 & 0 & -\alpha_1 & -\alpha_2 \\
0 & 0 & 0 & 1 & -\beta_1 & -\beta_2
\end{bmatrix}
\qquad
\begin{bmatrix}
Q_{d1} \\ Q_{s1} \\ Q_{d2} \\ Q_{s2} \\ P_1 \\ P_2
\end{bmatrix}
\qquad
\begin{bmatrix}
0 \\ a_0 \\ b_0 \\ 0 \\ \alpha_0 \\ \beta_0
\end{bmatrix}
$$