

Chp2 Matrix Algebra and Application

1. $A = \begin{bmatrix} -4 & 0 & 1 \\ 2 & -1 & 3 \\ 0 & 1 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 5 & -1 & 0 \\ 0 & 1 & -3 \\ 7 & 12 & 4 \end{bmatrix}$ $C = \begin{bmatrix} 0 & 1 \\ 2 & -1 \\ 5 & 3 \end{bmatrix}$

Find the value of

a) $A+B$

b) $A-B$

c) $B-A$

d) AB

e) $B^T A^T$

f) $A^T + B^T$

g) BC

h) $C^T A$

2. Find the determinant of each matrices

$$A = \begin{bmatrix} 1 & 2 \\ 3 & -2 \end{bmatrix} \quad B = \begin{bmatrix} 2 & 4 & -2 \\ 0 & -1 & 0 \\ 2 & 3 & 2 \end{bmatrix} \quad C = \begin{bmatrix} 2 & 4 & 1 & 5 \\ 3 & 2 & 5 & 1 \\ 1 & 2 & 1 & 4 \\ 3 & 4 & 3 & 2 \end{bmatrix}$$

3. Find the transposes of the matrices A,B,C and D

$$A = \begin{bmatrix} -1 & 3 \\ 0 & -2 \end{bmatrix} \quad B = \begin{bmatrix} 2 & 3 & 0 \\ 3 & -2 & -1 \\ 1 & 5 & -2 \end{bmatrix} \quad C = \begin{bmatrix} -1 & 2 \\ 2 & 1 \\ 1 & 2 \end{bmatrix} \quad D = \begin{bmatrix} 2 \\ 1 \\ 9 \end{bmatrix}$$

4. Find the inverse matrices of the matrices A,B and C

$$A = \begin{bmatrix} 6 & 5 \\ 2 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 4 & 0 & 2 \\ 5 & 3 & 1 \\ 2 & 1 & -2 \end{bmatrix}$$

5. Given $A = \begin{bmatrix} 4 & -2 & 0 \\ 1 & 7 & -1 \\ 0 & 2 & 1 \end{bmatrix}$ $B = \begin{bmatrix} -1 & 0 & 3 \\ 3 & 5 & -5 \\ 1 & 5 & 1 \end{bmatrix}$

Find the value of AB , A^{-1} , and prove that $(A^{-1})^T = (A^T)^{-1}$

6. Given $2x+4y=2$ and $3x+4y=1$, if $\begin{bmatrix} 2 & 4 \\ 3 & 4 \end{bmatrix}$ has the inverse of $\begin{bmatrix} -1 & 1 \\ 3/4 & -1/2 \end{bmatrix}$, find the solution.

7. Solve the following linear equation system by matrix inversion method

$$\begin{array}{ll} \text{a) } 4X-2Y=6 & \text{b) } 3X-Y+3Z=-2 \\ 2X+Y=5 & -X+Y+Z=0 \\ & 3X-2Y=0 \end{array}$$

8. Solve the following linear equation system by using Cramer's rule

$$\begin{array}{l} 4X+5Y=2 \\ 11X+Y+2Z=3 \\ X+5Y+2Z=1 \end{array}$$

9. Given $Q_d=220-5P$ and $Q_s=-20+3P$

Write the market model in matrix formation, then compute equilibrium using matrix inversion by determinant method

10. Given $18P_1 - P_2=87$ and $-2P_1+36P_2=98$

If $\begin{bmatrix} 18 & -1 \\ -2 & 36 \end{bmatrix}^{-1} = \begin{bmatrix} 18/323 & 1/646 \\ 1/323 & 9/323 \end{bmatrix}$, find the equilibrium price of these two goods, but if there is change in linear system and it becomes $18P_1 - P_2=174$ and $-2P_1+36P_2=196$, find the new equilibrium price of these.

11. Given the demand and supply functions of Pork(P) and Chicken (C) be

$$\begin{array}{l} Q_{dp}=82-3P_p+P_c \\ Q_{sp}=-5+15P_p \\ Q_{dc}=92+2P_p-4P_c \\ Q_{sc}=-6+32P_c \end{array}$$

Rewrite the two-market model in matrix form then compute the equilibrium prices and quantities of pork and chicken, and consider which type of goods they are (either substitute goods or complementary goods)

12. Given the demand function as $Q_d = 220 - 5P$ and supply function as $Q_s = -20 + 3P$, if the government collects unit tax 1 baht/unit from the seller, find equilibrium price and quantity.

13. Is there the inverse matrix of the following matrices?

$$A = \begin{bmatrix} 4 & 0 & 1 \\ 19 & 1 & 3 \\ 5 & 4 & 7 \end{bmatrix} \quad B = \begin{bmatrix} 7 & -1 & 0 \\ 1 & 1 & 4 \\ 13 & -3 & -4 \end{bmatrix}$$

14. From the macroeconomic model, the IS and LM equations are

$$0.3Y + 100R - 252 = 0$$

$$0.25Y - 200R - 176 = 0$$

Rewrite the model in matrix formation and using Cramer's Rule to compute the equilibrium Y and R .

15. Given the national-income model of a product market as follows;

$$C = 85 + 0.9Y$$

$$I_0 = 55$$

$$G_0 = 20$$

$$X = 100$$

$$M = 10 + 0.3Y$$

Write this model in the matrix form and solve the system.

16. Given the product market model as follows;

$$3P + Q - 71 = 0 \quad \text{and} \quad 6P - Q - 10 = 0$$

- Write this model in the matrix form and solve the system using Cramer's Rule
- If the government imposes an excise tax of 2 baht per unit, solve the new equilibrium using Cramer's Rule

17. Using Cramer's Rule to solve the equilibrium, of the following national-income model

Product market

$$C = 100 + 0.75Y_d$$

$$Y_d = Y - T$$

$$T = 20 + 0.2Y$$

$$I=1200-30R$$

$$G=935$$

Money Market

$$M_d=1375+0.25Y-25R$$

$$M_s=2500$$

Find the equilibrium of the economy