

Quiz #2 - EconS 527
November 5th, 2018

Question #1 (50 Points)

By using the matrix method, solve the system

$$\begin{aligned}2x + 3y &= -1 \\2x + y &= 5 \\x + y &= 1\end{aligned}$$

Solution

$$A = \left(\begin{array}{cc|c} 2 & 3 & -1 \\ 2 & 1 & 5 \\ 1 & 1 & 1 \end{array} \right) \xrightarrow{\text{Row3} \times -2 \rightarrow \text{Row2}} \left(\begin{array}{cc|c} 2 & 3 & -1 \\ 0 & -1 & 3 \\ 1 & 1 & 1 \end{array} \right) \xrightarrow{\text{Row1} \times -\frac{1}{2} \rightarrow \text{Row3}} \left(\begin{array}{cc|c} 2 & 3 & -1 \\ 0 & -1 & 3 \\ 0 & -\frac{1}{2} & \frac{3}{2} \end{array} \right)$$

$$\xrightarrow{\text{Row2} \times -\frac{1}{2} \rightarrow \text{Row3}} \left(\begin{array}{cc|c} 2 & 3 & -1 \\ 0 & -1 & 3 \\ 0 & 0 & 0 \end{array} \right) \xrightarrow{\text{Row2} \times -1} \left(\begin{array}{cc|c} 2 & 3 & -1 \\ 0 & 1 & -3 \\ 0 & 0 & 0 \end{array} \right) \xrightarrow{\text{Row1} \times \frac{1}{2}} \left(\begin{array}{cc|c} 1 & \frac{3}{2} & -\frac{1}{2} \\ 0 & 1 & -3 \\ 0 & 0 & 0 \end{array} \right) \xrightarrow{\text{Row2} \times -\frac{3}{2} \rightarrow \text{Row1}} \left(\begin{array}{cc|c} 1 & 0 & 4 \\ 0 & 1 & -3 \\ 0 & 0 & 0 \end{array} \right)$$

Hence, it has a unique solution, $x = 4$ and $y = -3$

Question #2 (50 Points)

Consider the following matrices

$$A = \begin{pmatrix} 2 & 7 & 1 \\ 0 & 3 & -2 \\ 0 & 0 & 4 \end{pmatrix} \text{ and } B = \begin{pmatrix} 2 \\ 7 \\ 4 \end{pmatrix}$$

Solve the system of linear equations by back-substitution.

Solution

The system of linear equations is

$$\begin{aligned}2x + 7y + z &= 2 \\3y - 2z &= 7 \\4z &= 4\end{aligned}$$

hence, the unique solution is $x = -10$, $y = 3$ and $z = 1$.