1. Determine for what values of k each system has i) a unique solution, ii) no solution, or iii) infinitely many solutions.

a) $\begin{aligned} 3x + 2y &= 1 \\ 6x + 4y &= k \end{aligned}$ b) $\begin{aligned} 3x + 2y &= 11 \\ 6x + ky &= 21 \end{aligned}$

2. Determine h and k, if possible, such that the following system has i) no solution, ii) a unique solution, or iii) infinitely many solutions.

$$\begin{aligned} x + 3y &= k \\ 4x + hy &= 8 \end{aligned}$$

3. Use Gauss- Jordan Elimination to solve the systems.

$a)$ $\begin{aligned} 2x_1 + 2x_2 + 4x_3 &= 2 \\ x_1 - x_2 - 4x_3 &= 3 \\ 2x_1 + 7x_2 + 19x_3 &= -3 \end{aligned}$ $b)$ $\begin{aligned} x_1 + 3x_2 + 2x_3 &= 5 \\ 2x_1 + 5x_2 + 2x_3 &= 3 \\ 2x_1 + 7x_2 + 7x_3 &= 22 \end{aligned}$

$c)$ $\begin{aligned} x_1 + x_2 + x_3 - x_4 &= -4 \\ x_1 - 2x_2 - 2x_3 + 8x_4 &= -1 \\ 2x_1 + 3x_2 - x_3 + 3x_4 &= 11 \end{aligned}$

4. Let

$$A = \begin{bmatrix} 4 & 1 \\ -3 & 2 \end{bmatrix}, \quad B = \begin{bmatrix} 3 & 2 \\ 2 & 3 \\ 1 & -1 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}, \quad D = \begin{bmatrix} 1 & -3 & 5 \\ 4 & 0 & 2 \end{bmatrix}, \quad E = [2 \quad 1], \quad F = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$$

Find, if possible, each of the following.

a) $A + B$ b) $3B^T - 2D$ c) EF d) FE e) DB f) BB^T

g) Find AC and CA, does $AC = CA$?