Week 2 Michaelmas

Solving Linear Systems

1. A solution to a 2×2 simultaneous equation

$$\begin{aligned} a_1 * x + a_2 * y &= k_1 \\ b_1 * x + b_2 * y &= k_2 \end{aligned}$$

can be obtained by

$$\begin{aligned} x &= \frac{k_1 * b_2 - k_2 * a_2}{a_1 * b_2 - b_1 * a_2} \\ y &= \frac{a_1 * k_2 - b_1 * k_1}{a_1 * b_2 - b_1 * a_2} \end{aligned}$$

provided $a_1 * b_2 - b_1 * a_2 \neq 0$.
Using this technique, solve the following simultaneous equations:

(a)

$$\begin{aligned} x + 5 * y &= 40 \\ 4 * x + 3 * y &= 41 \end{aligned}$$

(b)

$$\begin{aligned} 2 * x + 3 * y &= 18 \\ 3 * x + 4 * y &= 26 \end{aligned}$$

(c)

$$\begin{aligned} 2 * x - y &= 8 \\ 5 * x - y &= 26 \end{aligned}$$

(d)

$$\begin{aligned} x - y &= 1 \\ 3 * x + 2 * y &= 33 \end{aligned}$$

2. Using the Gaussian Elimination technique, solve each of the following simultaneous equations:

   (a)

$$\begin{aligned} 2 * x + y &= 21 \\ 3 * x - y &= 24 \end{aligned}$$

   (b)

$$\begin{aligned} 5 * x + 2 * y &= 49 \\ 2 * x - 4 * y &= 10 \end{aligned}$$

   (c)

$$\begin{aligned} 4 * x + 3 * y &= 35 \\ 5 * x + y &= 30 \end{aligned}$$

   (d)

$$\begin{aligned} 5 * x + y &= 27 \\ 2 * x + y &= 12 \end{aligned}$$