Solutions for Lab 20
Introduction to MatLab

Linear Algebra by hand

$$2x + y - z = 0$$

$$x - y + z = 6$$

$$x + 2y + z = 3$$

Substitution

Equation 2:

$$x = 6 + y - z$$

Equation 3:

$$6 + y - z + 2y + z = 3$$

$$6 + 3y = 3$$

$$3y = -3$$

$$y = -1$$

Equation 1:

$$2\,(6 + (-1) - z) + (-1) - z = 0$$

$$2(5 - z) - 1 - z = 0$$

$$10 - 2z - 1 - z = 0$$

$$-3z = -9$$

$$z = 3$$

Equation 2:

$$x = 6 + (-1) - 3$$

$$x = 2$$

Gauss-Jordan row elimination

Matrix:

$$\begin{bmatrix} 2 & 1 & -1 \\ 1 & -1 & 1 \\ 1 & 2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 6 \\ 3 \end{bmatrix}$$

Matrix to work with:

$$\begin{bmatrix} 2 & 1 & -1 \\ 1 & -1 & 1 \\ 1 & 2 & 1 \end{bmatrix} \begin{bmatrix} 0 \\ 6 \\ 3 \end{bmatrix}$$

r2’=r2-r3:

$$\begin{bmatrix} 2 & 1 & -1 \\ 0 & -3 & 0 \\ 1 & 2 & 1 \end{bmatrix} \begin{bmatrix} 0 \\ 3 \\ 3 \end{bmatrix}$$

r3’=r3-(1/2)r1

$$\begin{bmatrix} 2 & 1 & -1 \\ 0 & -3 & 0 \\ 0 & 1.5 & 1.5 \end{bmatrix} \begin{bmatrix} 0 \\ 3 \\ 3 \end{bmatrix}$$

r3’’=2r3’

$$\begin{bmatrix} 2 & 1 & -1 \\ 0 & -3 & 0 \\ 0 & 3 & 3 \end{bmatrix} \begin{bmatrix} 0 \\ 3 \\ 6 \end{bmatrix}$$

r3’’’=r3’’+r2’

$$\begin{bmatrix} 2 & 1 & -1 \\ 0 & -3 & 0 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} 0 \\ 3 \\ 9 \end{bmatrix}$$

Hence,

$$z = 3$$

$$y = -1$$

$$2x + (-1) - 3 = 0$$

$$x = 2$$

MatLab

Inverse

```
>> A=[2  1 -1; 1 -1 1; 1 2 1]

A =

     2     1    -1
     1    -1     1
     1     2     1

>>  b=[0; 6; 3]

b =

     0
     6
     3

>>  inv(a)*b

ans =

     2
    -1
     3

>>
```

Gauss-Jordan Elimination

```
>> A=[2  1 -1; 1 -1 1; 1 2 1]

A =

     2     1    -1
     1    -1     1
     1     2     1

>> b=[0; 6; 3]

b =

     0
     6
     3

>> A\b

ans =

     2
    -1
     3

>>
```