

## How to use MATLAB or FREEMAT to Solve a System of Simultaneous Linear Equations

To find the solution of a matrix equation

$$\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nm} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ \vdots \\ b_n \end{bmatrix}$$

use the following code:

```
a=[a11 a12 ... a1n; a21 a22 ... a2n; ... ; an1 an2 ... anm];  
b=[b1; b2; ... ; bn];  
x=inv(a)*b
```

or

```
a=[a11 a12 ... a1n; a21 a22 ... a2n; ... ; an1 an2 ... anm];  
b=[b1; b2; ... ; bn];  
x=a\b
```

### **Example 1:**

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 4 \\ 10 \end{bmatrix}$$

may be solved as follows:

```
a=[1 2; 3 4];  
b=[4; 10];  
x=inv(a)*b
```

```
x =  
 2  
 1
```

**Example 2:**

$$\begin{bmatrix} 1 & 0 & 2 & 0 \\ 0 & 3 & 0 & 4 \\ 1 & 0 & -1 & 2 \\ -2 & 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 1 \\ -4 \\ -1 \\ -2 \end{bmatrix}$$

may be solved as follows:

`a=[1 0 2 0; 0 3 0 4; 1 0 -1 2; -2 1 0 0];`

`b=[1; -4; -1; -2];`

`x=a\b`

`x =`

`1`

`0`

`0`

`-1`