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

To find the solution of a matrix equation

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

use the following code:

$$a = \begin{bmatrix} a_{11} & a_{12} \cdots & a_{1n}; & a_{21} & a_{22} \cdots & a_{2n}; & \cdots & ; & a_{n1} & a_{n2} \cdots & a_{nn} \end{bmatrix};$$
$$b = \begin{bmatrix} b_1; & b_2; & \cdots & ; & b_n \end{bmatrix};$$
$$x = inv(a) * b$$

or

$$a = \begin{bmatrix} a_{11} & a_{12} \cdots & a_{1n}; & a_{21} & a_{22} \cdots & a_{2n}; & \cdots & ; & a_{n1} & a_{n2} \cdots & a_{nn} \end{bmatrix};$$
$$b = \begin{bmatrix} b_1; & b_2; & \cdots & ; & b_n \end{bmatrix};$$
$$x = a \backslash b$$

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
```