1. Given a square matrix $[A]$, write a single line MATLAB command that will create a new matrix $[Aug]$ that consists of the original matrix $[A]$ augmented by an identity matrix $[I]$.

2. A number of matrices are defined as

$$[A] = \begin{bmatrix} 4 & 7 \\ 1 & 2 \\ 5 & 6 \end{bmatrix} \qquad [B] = \begin{bmatrix} 4 & 3 & 7 \\ 1 & 2 & 7 \\ 2 & 0 & 4 \end{bmatrix}$$

$$\{C\} = \begin{Bmatrix} 3 \\ 6 \\ 1 \end{Bmatrix} \qquad [D] = \begin{bmatrix} 9 & 4 & 3 & -6 \\ 2 & -1 & 7 & 5 \end{bmatrix}$$

$$[E] = \begin{bmatrix} 1 & 5 & 8 \\ 7 & 2 & 3 \\ 4 & 0 & 6 \end{bmatrix}$$

$$[F] = \begin{bmatrix} 3 & 0 & 1 \\ 1 & 7 & 3 \end{bmatrix} \qquad \lfloor G \rfloor = \lfloor 7\ 6\ 4 \rfloor$$

Answer the following questions regarding these matrices:

(a) What are the dimensions of the matrices?

(b) Identify the square, column, and row matrices.

(c) What are the values of the elements: a_{12}, b_{23}, d_{32}, e_{22}, f_{12}, g_{12}?

(d) Perform the following operations:

(1) $[E] + [B]$	(2) $[A] + [F]$	(3) $[B] - [E]$
(4) $7 \times [B]$	(5) $\{C\}^T$	(6) $[E] \times [B]$
(7) $[B] \times [A]$	(8) $[D]^T$	(9) $[A] \times \{C\}$
(10) $[I] \times [B]$	(11) $[E]^T \times [E]$	(12) $\{C\}^T \times \{C\}$

3. An important problem in structural engineering is that of finding the forces in a statically determinate truss (Fig. 1.). This type of structure can be described as a system of coupled linear algebraic equations derived from force balances. The sum of the forces in both horizontal and vertical directions must be zero at each node, because the system is at rest. Therefore, for node 1:

$$\sum F_H = 0 = -F_1 \cos 30^\circ + F_3 \cos 60^\circ + F_{1,h}$$

$$\sum F_V = 0 = -F_1 \sin 30^\circ - F_3 \sin 60^\circ + F_{1,v}$$

for node 2:

$$\sum F_H = 0 = F_2 + F_1 \cos 30^\circ + F_{2,h} + H_2$$

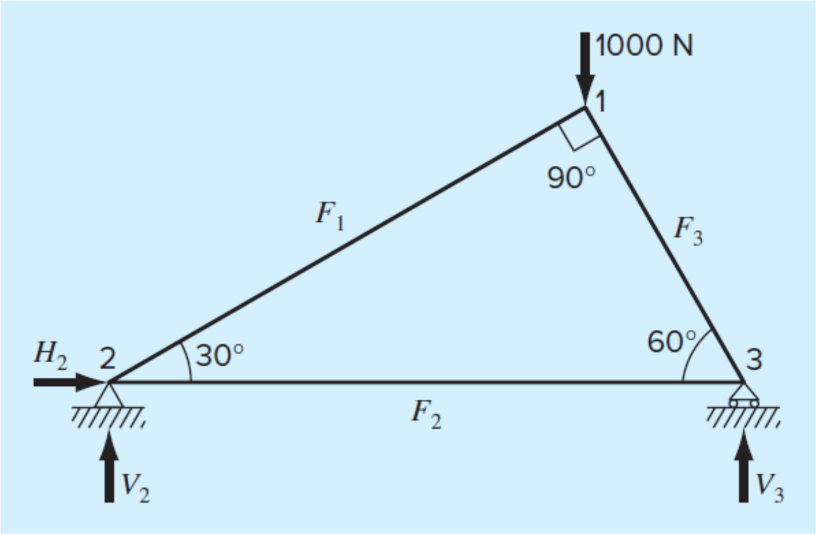
$$\sum F_V = 0 = F_1 \sin 30^\circ + F_{2,v} + V_2$$

for node 3:

$$\sum F_H = 0 = -F_2 - F_3 \cos 60^\circ + F_{3,h}$$

$$\sum F_V = 0 = F_3 \sin 60^\circ + F_{3,v} + V_3$$

where $F_{i,h}$ is the external horizontal force applied to node i (where a positive force is from left to right) and $F_{i,v}$ is the external vertical force applied to node i (where a positive force is upward). Thus, in this problem, the 2000-N downward force on node 1 corresponds to $F_{i,v} = -2000$. For this case, all other $F_{i,v}$'s and $F_{i,h}$'s are zero. Express this set of linear algebraic equations in matrix form and then use MATLAB to solve for the unknowns.



(Fig. 1.)