Entering Matrices and Vectors in Matlab

A row vector is entered as

\[ \text{v} = [7 \ 3 \ 9] \]

\[ \text{v} = \\
7 \ 3 \ 9 \]

Elements in a row are separated by spaces or commas.

Semicolons separate rows. An example of a column vector is

\[ \text{w} = [2; \ 6; \ 1] \]

\[ \text{w} = \\
2 \ 6 \ 1 \]

An example of a 3 x 3 matrix is

\[ \text{A} = \begin{bmatrix} 1 & 2 & 3 \\ 5 & 7 & 11 \\ 13 & 17 & 19 \end{bmatrix} \]

\[ \text{A} = \\
1 \ 2 \ 3 \\
5 \ 7 \ 11 \\
13 \ 17 \ 19 \]

Elements of a matrix can be referred to with subscript notation. For example,

\[ \text{A} = \begin{bmatrix} 1 & 2 & 3 \\ 5 & 7 & 11 \\ 13 & 17 & 19 \end{bmatrix} \]

\[ \text{A}(3,2) \]

\[ \text{ans} = \\
17 \]

A colon can be used as a wild card to refer to an entire row or column:

\[ \text{A}( :, 1) \]

\[ \text{ans} = \\
1 \\
5 \\
13 \]

Matrix Operations

Addition and Multiplication operators for matrices are + and *, if the dimensions are correct. To see the dimension, type

\[ \text{size(A)} \]

\[ \text{ans} = \\
3 \quad 3 \]
The transpose operator is a single quote appended to a matrix or vector, so if

\[
\text{\texttt{>>v = [7 3 9]}}
\]

\[
\text{\texttt{v =}}
\]

\[
\begin{bmatrix}
7 & 3 & 9
\end{bmatrix}
\]

then

\[
\text{\texttt{>>v'}}
\]

\[
\text{\texttt{ans =}}
\]

\[
\begin{bmatrix}
7 \\
3 \\
9
\end{bmatrix}
\]

A matrix transpose uses the same notation.

The inverse can be found by

\[
\text{\texttt{>>inv(A)}}
\]

Exercises

1. Let

\[
\text{\texttt{A =}}
\]

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

and

\[
\text{\texttt{B =}}
\]

\[
\begin{bmatrix}
4 & -2 & 3 \\
1 & 5 & 0 \\
6 & 1 & 2
\end{bmatrix}
\]

(a) Calculate \(A^T + B^T\).

(b) Calculate \((A + B)^T\).

(c) Are (a) and (b) the same? If not, how do they differ?

2. Let

\[
\text{\texttt{x =}}
\]

\[
\begin{bmatrix}
0 \\
1 \\
1
\end{bmatrix}
\]

and

\[
\text{\texttt{y =}}
\]

\[
\begin{bmatrix}
1 \\
2 \\
2
\end{bmatrix}
\]

(a) Calculate \(x^Ty\).

(b) Calculate \(y^Tx\).

(c) Are (a) and (b) the same? If not, how do they differ?

3. Let

\[
\text{\texttt{A =}}
\]

\[
\begin{bmatrix}
1 & -2 & 1 \\
0 & 2 & -1 \\
2 & 1 & 1
\end{bmatrix}
\]

and

\[
\text{\texttt{B =}}
\]

\[
\begin{bmatrix}
2 & 1 & -1 \\
1 & -1 & 0 \\
2 & -1 & 1
\end{bmatrix}
\]

(a) Calculate \(AB\).

(b) Calculate \(BA\).

(c) Are (a) and (b) the same? If not, how do they differ?

4. Let

\[
\text{\texttt{A =}}
\]

\[
\begin{bmatrix}
3 & -1 \\
6 & 2
\end{bmatrix}
\]

(a) Calculate \(|A|\).

(b) Calculate \(A^{-1}\).

(c) Calculate \(AA^{-1}\).

(d) Calculate \(A^{-1}A\).

(e) Are (c) and (d) the same? If not, how do they differ?