# Entering Matrices and Vectors in MATLAB

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## *Overview*

In this first hands-on introduction to MATLAB you will start to become familiar with the MATLAB command window, entering matrices, making assignments, and performing basic matrix and vector operations.

## *Part I*

The following commands should be entered and executed to understand how you can enter information and obtain results within a MATLAB session. (There is no need to enter the comments; they are included for your benefit as you read this document.)

- Online help

```
>> help help                % Online help can be very useful!
```

- Elementary calculations

```
>> 2 + 3
>> 4 + sqrt(2)
>> 5 + sqrt(2);             % the semi-colon suppresses the answer
>> ans                      % to see the last answer
```

- Entering Vectors

```
>> v = [ 1 2 3 ]            % row vector
>> v2 = [ 1, 2, 3 ]         % there is no difference between v and v2
>> w = [ 1; 2; 3 ]          % column vector
>> w2 = [ 1                 % is there a difference if we enter
2                           % a column vector as follows?
3]
```

- Entering Matrices

```
>> A = [ 1 2 3; 4 5 6; 7 8 9 ]      % matrix
>> A = [ 1, 2, 3; 4, 5, 6; 7, 8, 9 ]  % the same matrix
>> A = [ 1 2 3                      % and a third definition
4 5 6                               % of the same matrix
7 8 9]
```

- Editing Coefficients in a Vector or Matrix

```
>> w(1) = 0                 % change first entry in vector w
>> A(2,3)=10                % change one coefficient in matrix A
```

- Transpose

```
>> w'                    % transpose of a column vector
>> A'                    % transpose of a matrix
```

- Accessing Defined Quantities

```
>> who                   % list of all assigned variables
>> whos                  % how do who and whos differ?
>> A, v, w               % type the name of a variable
>>                       % to see its contents
```

- Miscellaneous Vector and Matrix Operations

```
>> B = [ 1 0 -1; 0 3 5; 6 2 3]     % define 3x3 matrix B
>> C = [4 -1 3; 0 2 -5]            % define 2x3 matrix C
>> z = v + 2*w'                    % compute these quantities
>> A + B                           % be sure you understand each result
>> A - C                           % (particularly the ones that are not defined)
>> A * B
>> C * A
>> A * C
>> A'* B'
>> B'* A'
>> (A*B)'                          % which of A'*B'and B'*A'equals (A*B)'?
```

- Building Matrices from Blocks

```
>> D = [ A B ]
>> E = [ A B B A ]                 % (or [ A B; B A ]) >> >>
```

- Selecting Sub-Vectors and Sub-Matrices

```
>> D(:,3)                % 3rd column of D
>> D(2,:)                % 2nd row of D
>> E(1:3,:)              % 1st 3 rows of E
>> E(2:4,1:3)            % a 3x3 submatrix of E
```

- Special Matrices

```
>> help eye              % identity matrix
>> help zeros            % zero matrix
>> help ones             % matrix with all entries equal to one
```

Challenge: Create the $3 \times 6$ zero matrix, the $4 \times 4$ identity matrix, and the $5 \times 3$ matrix with all entries equal to 2.

- Exiting `MATLAB`

```
>> quit
```