

Recitation 1-MATLAB (09/10/04)

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OUTLINE

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The basic data element in MATLAB is the array.

In MATLAB, a matrix is a rectangular array of numbers.

i.e a scalar is a 1 by 1 matrix;

i.e a vector is a 1 by n matrix or an n by 1 matrix.

Generating matrices

Four ways to enter matrices:

1. Enter an explicit list of elements;
2. Load matrices from external data files;
3. Generate matrices using built-in functions;
4. Create matrices with your own functions.

In this document we will make reference to 1 and 3.

Displaying data

Enter the following matrix **A** in the MATLAB window:

```
>>A = [16 3 2 13; 5 10 11 8; 9 6 7 12; 4 15 14 1]
```

The following are some of the ways in which you can display specific data of matrix **A**:

>>A(1,1)	displays the element in the first row, first column of A
>>A(:, 1)	displays the first column of A
>>A([1 2], [1 2])	displays the first two rows and columns of A
>>A([2 3], :)	displays the second and third rows of A

Colon operator

The colon operator can be used to generate vectors such as a row vector that contains integers from 1 to 10

```
>>1:10
```

or more interesting row vector such as

```
>>100 : -7 : 50
```

or

```
>>0:pi/4:4
```

Built in functions

MATLAB has many built in functions you can use to generate matrices. Remember matrix A? This matrix can be built using the Magic function:

```
>>B = magic(4)
```

B looks like A except that columns 2 and 3 are exchanged. To swap both columns do the following;

```
>>A = B(:, [1 3 2 4])
```

Matrix and array operations

Matrix operations: operations defined by the rules of linear algebra.

+ - * / \ ^ ' .

Array operations: operations carried out element by element (.).

+ - .* ./ .\ .^ .' .

Matrices can be added to each other, subtracted from one another, and multiplied with other matrices or vectors, as long as they have the proper dimensions... but division of matrices by vectors or other matrices is NOT defined. \ and / do not represent true division, rather shortcuts for multiplication by the inverse of a matrix.

Generating matrices with functions

MATLAB has four functions to generate basic matrices: zeros(), ones(), rand()
randn().

Try the following:

```
>>Z = zeros (2,5)
```

```
>>F = 6 *(ones (3,3)
```

```
>>N = fix(10*rand(1,10))
```

```
>>R = rand(4,4)
```

Changing matrices

Modifications to matrices are sometimes useful, like deleting rows or columns, or reshaping matrices.

To delete the 4th column of a matrix D that looks like A do the following:

```
>>D = A;  
>>D(:,4) = []
```

Then try reshaping matrix D by doing the following:

```
>>reshape(D,2,6)
```

Matrix entry shortcuts and useful commands

>>eye(3)	3 by 3 identity matrix
>>repmat(eye(2),3,4)	replicates 12 copies of a second-order identity matrix
>>who	shows all the variables stored in memory
>>whos	shows variables, dimension and bytes
>>help polyval	displays information about the function polyval
>>clear A	erases A from memory
>>clear	erases memory