

# Lecture 2: Vectors and Matrices

```
% Defining vectors and basic arithmetic
1:6
(1:6)'  
x = [1 2 3]  
y = [2 3 4]'  
a = 1:3:7  
b = (1:3:7)  
a - b  
a = 0:0.2:1  
a = 1:-0.2:0  
length(a)  
a(1)  
a(length(a))  
a(end)
```

```
% Equivalent statements
```

```
a
```

```
a(1:length(a))
```

```
a(1:end)
```

```
% Some simple mistakes
```

```
a - b          % if dimensions are not the same
```

```
a(8)          % if length(a) < 8
```

```
a + [1 2]     % if dimensions are not the same
```

```
% Useful for debugging
```

```
size(a)
```

```
size(b)
```

```
size([1 2])
```

```
% The following vectors are the same
```

```
z = [1; 2; 3]
```

```
z = [1
```

```
    2
```

```
    3]
```

```
% The following operations are not the same
```

```
x*y
```

```
y*x
```

```
% Fun with prime numbers and vectors
```

```
isprime(123456)
```

```
c = factor(123456)
```

```
prod(c)
```

```
primes(123456)
```

```
% Vectors can be complex
```

```
% where the (imaginary) number i = sqrt(-1)
```

```
x = [6+i; 12; 5]
```

```
% Defining a matrix
```

```
A=[1,2,3 ; 4 6 7 ; 1 3 4]
```

```
B=i*[1,2,3 ; 4 6 7 ; 1 3 4] + A
```

```
% Accessing values in a matrix
```

```
a23 = A(2,3)
```

```
A(2,:)
```

```
A(2:3,2:end)
```

```
A(2:end,2:end)
```

```
% The symbol ' for transposing a vector or matrix
```

```
A'
```

```
transpose(A)
```

```
transpose(A) - A'
```

```
[1;2;3]
```

```
[1;2;3]'
```

```
% Using the symbol ' for complex vectors
```

```
% The use of the symbol ' also conjugates the
```

```
% vector (changes the sign of the imaginary part).
```

```
x
```

```
x'
```

```
x.'
```

```
% Using the symbol ' for complex matrices
% The use of the symbol ' also conjugates the
% matrix (changes the sign of the imaginary part).
B
B'
B.'

% Element by element operations using the . symbol
x = [1 2 3]
y = [2 3 4]
x.*y
y.*x

% The following are not the same
x'*y
y'*x

% Study and visualize to understand more
% about matrix multiplications
doc mtimes
```

```
% Other array (vector or matrix) functions
```

```
A^2
```

```
A.^2
```

```
det(A)
```

```
inv(A)
```

```
det(inv(A))
```

```
eig(A)
```

```
spy(A)
```

```
rand(5,1)
```

```
rand(1,5)
```

```
rand(5,5)
```

```
mean(1:10)
```

```
mean(rand(10,1))
```

```
mean(rand(100000,1))
```