

# Introducció al Matlab

## Vectors

```
x = [1 2 3 4 5] % vector fila
```

```
x = 1x5  
    1     2     3     4     5
```

```
y = [5;6;7;8;9] % vector columna (normal de crear)
```

```
y = 5x1  
     5  
     6  
     7  
     8  
     9
```

```
z = x' % trasposta
```

```
z = 5x1  
     1  
     2  
     3  
     4  
     5
```

```
z = 1:1:5
```

```
z = 1x5  
     1     2     3     4     5
```

```
q = zeros([1 5]) % [files columnes]
```

```
q = 1x5  
     0     0     0     0     0
```

```
k = ones([5 1])
```

```
k = 5x1  
     1  
     1  
     1  
     1  
     1
```

```
x*y
```

```
ans = 115
```

```
norm(x)
```

```
ans = 7.4162
```

```
x*x' % mòdul al quadrat
```

```
ans = 55
```

```
norm(x)^2
```

```
ans = 55
```

```
x(1)
```

```
ans = 1
```

## Matrius

```
X = [1 2 3; 4 5 6; 6 7 8]
```

```
X = 3×3
```

|   |   |   |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |
| 6 | 7 | 8 |

```
X(2,3) % (files, columnes)
```

```
ans = 6
```

```
[files columnes] = size(X)
```

```
files = 3
```

```
columnes = 3
```

```
ndims(X); % ; no imprimeix per pantalla  
% concatenar matrius
```

```
Y = [X X]
```

```
Y = 3×6
```

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 1 | 2 | 3 |
| 4 | 5 | 6 | 4 | 5 | 6 |
| 6 | 7 | 8 | 6 | 7 | 8 |

```
Y = [X; X]
```

```
Y = 6×3
```

|   |   |   |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |
| 6 | 7 | 8 |
| 1 | 2 | 3 |
| 4 | 5 | 6 |
| 6 | 7 | 8 |

```
Z = [X X; X X]
```

```
Z = 6×6
```

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 1 | 2 | 3 |
| 4 | 5 | 6 | 4 | 5 | 6 |
| 6 | 7 | 8 | 6 | 7 | 8 |
| 1 | 2 | 3 | 1 | 2 | 3 |
| 4 | 5 | 6 | 4 | 5 | 6 |
| 6 | 7 | 8 | 6 | 7 | 8 |

```
Z(Z==6) = -1
```

```
Z = 6×6
```

|   |   |    |   |   |    |
|---|---|----|---|---|----|
| 1 | 2 | 3  | 1 | 2 | 3  |
| 4 | 5 | -1 | 4 | 5 | -1 |

|    |   |    |    |   |    |
|----|---|----|----|---|----|
| -1 | 7 | 8  | -1 | 7 | 8  |
| 1  | 2 | 3  | 1  | 2 | 3  |
| 4  | 5 | -1 | 4  | 5 | -1 |
| -1 | 7 | 8  | -1 | 7 | 8  |

```
Z(Z<3) = 0
```

```
Z = 6x6
```

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 0 | 0 | 3 | 0 | 0 | 3 |
| 4 | 5 | 0 | 4 | 5 | 0 |
| 0 | 7 | 8 | 0 | 7 | 8 |
| 0 | 0 | 3 | 0 | 0 | 3 |
| 4 | 5 | 0 | 4 | 5 | 0 |
| 0 | 7 | 8 | 0 | 7 | 8 |

```
% Z (Z ~= 0) = 1 % valors diferents a 0 = 1
```

```
Z(1:2,1:end) = 10 % (files, columnes)
```

```
Z = 6x6
```

|    |    |    |    |    |    |
|----|----|----|----|----|----|
| 10 | 10 | 10 | 10 | 10 | 10 |
| 10 | 10 | 10 | 10 | 10 | 10 |
| 0  | 7  | 8  | 0  | 7  | 8  |
| 0  | 0  | 3  | 0  | 0  | 3  |
| 4  | 5  | 0  | 4  | 5  | 0  |
| 0  | 7  | 8  | 0  | 7  | 8  |

```
%Z(:, 4) = [] % esborrar la quarta columna (:) totes les files
```

```
Y = Z(4:end, 3:end) % retallar
```

```
Y = 3x4
```

|   |   |   |   |
|---|---|---|---|
| 3 | 0 | 0 | 3 |
| 0 | 4 | 5 | 0 |
| 8 | 0 | 7 | 8 |

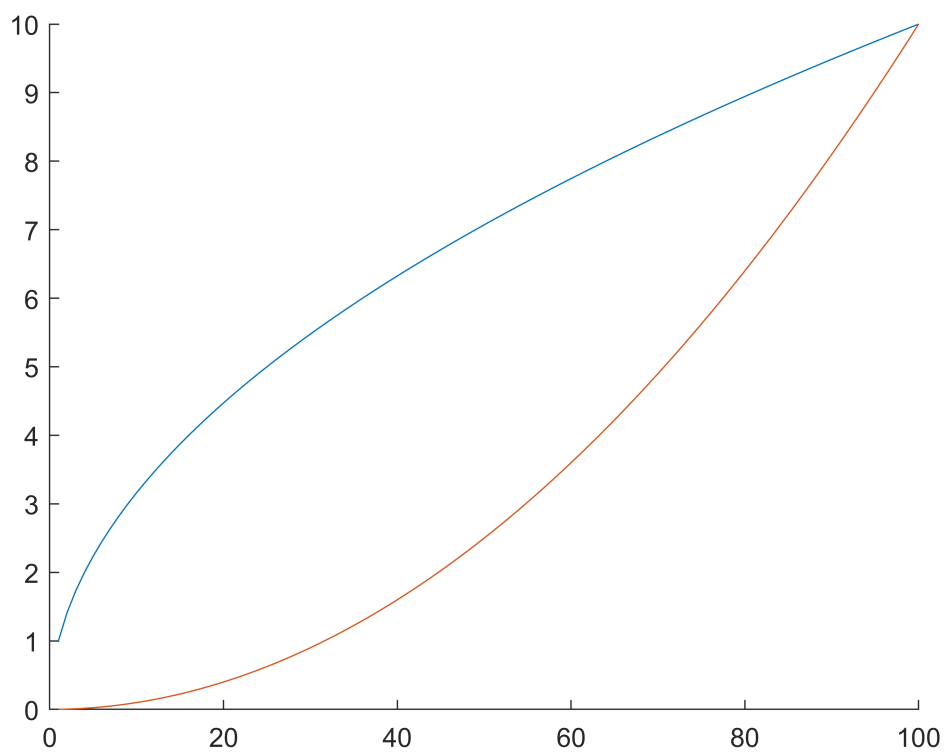
## Plots

```
x = 1:1:100;
y = sqrt(x);
z = x.*x/1000 % multiplicació element a element
```

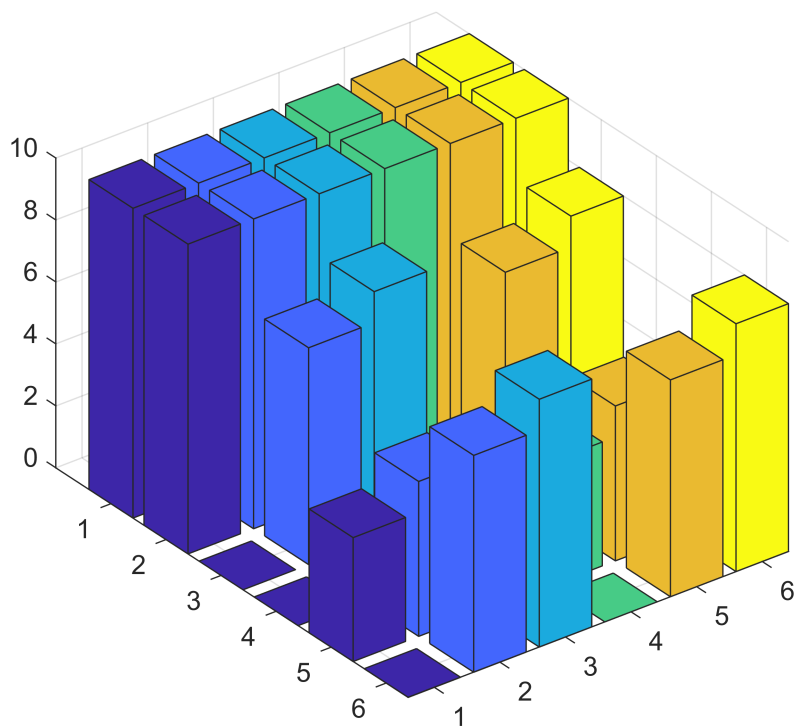
```
z = 1x100
```

|        |        |        |        |        |        |        |            |
|--------|--------|--------|--------|--------|--------|--------|------------|
| 0.0010 | 0.0040 | 0.0090 | 0.0160 | 0.0250 | 0.0360 | 0.0490 | 0.0640 ... |
|--------|--------|--------|--------|--------|--------|--------|------------|

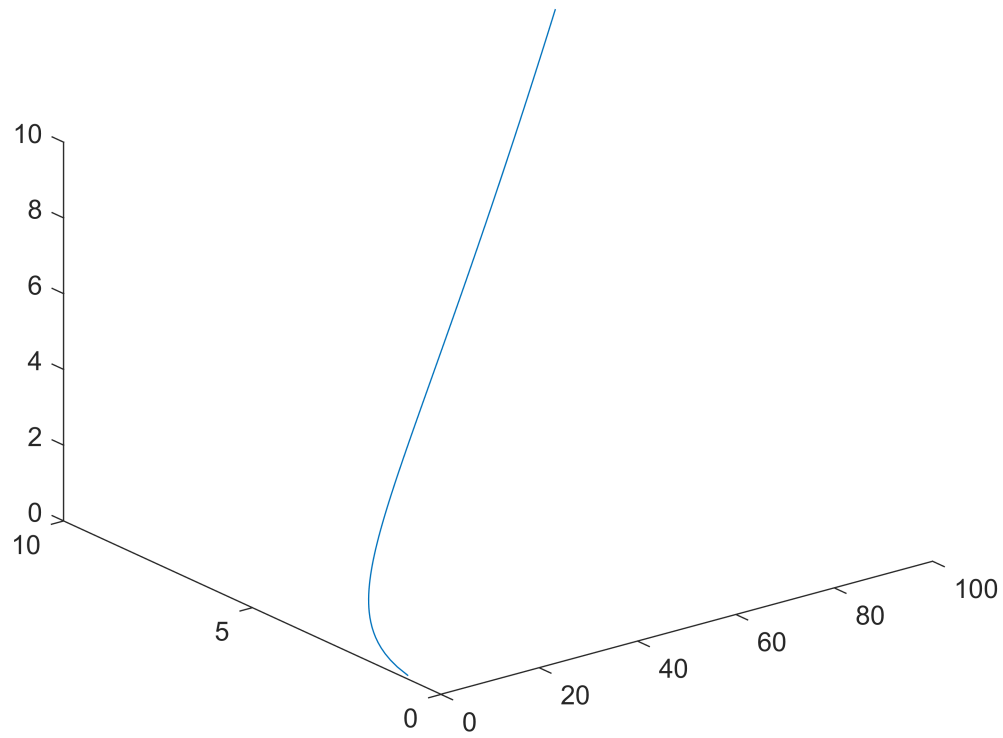
```
hold on % per combinar plots
plot(x,y)
plot(x,z);
hold off
```



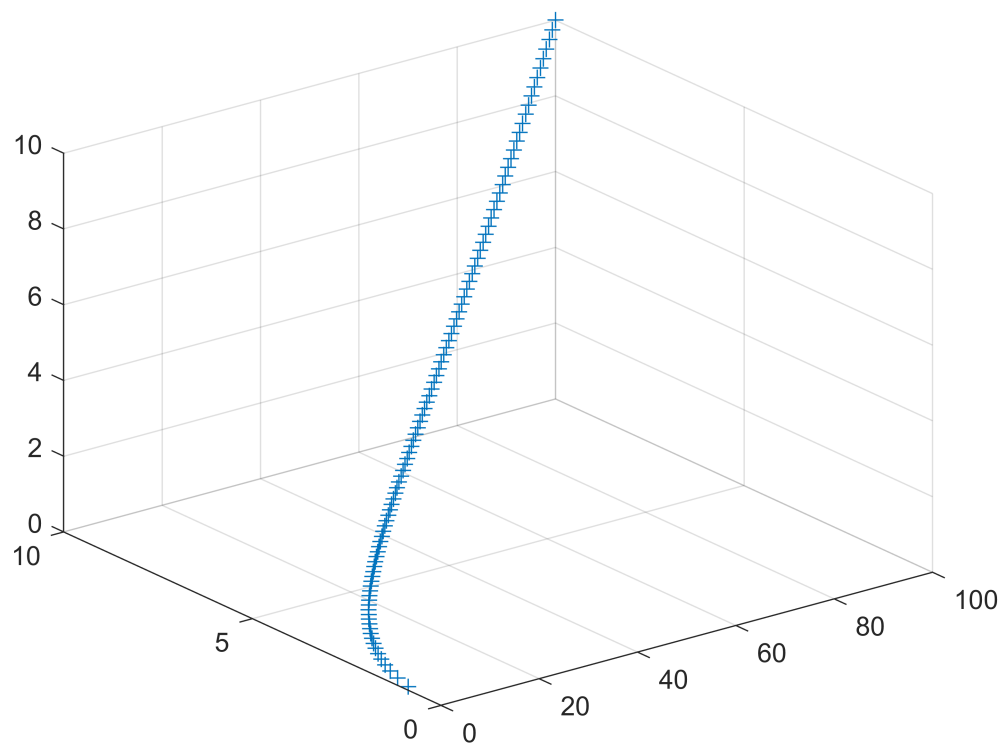
bar3(Z)



```
plot3(x,y,z)
```



```
scatter3(x,y,z, '+' )
```



## Funcions bàsiques

Z

Z = 6×6

|    |    |    |    |    |    |
|----|----|----|----|----|----|
| 10 | 10 | 10 | 10 | 10 | 10 |
| 10 | 10 | 10 | 10 | 10 | 10 |
| 0  | 7  | 8  | 0  | 7  | 8  |
| 0  | 0  | 3  | 0  | 0  | 3  |
| 4  | 5  | 0  | 4  | 5  | 0  |
| 0  | 7  | 8  | 0  | 7  | 8  |

```
% Z = rand([10 10]);
```

```
mc = max(Z) % màxim de cada columna
```

mc = 1×6

|    |    |    |    |    |    |
|----|----|----|----|----|----|
| 10 | 10 | 10 | 10 | 10 | 10 |
|----|----|----|----|----|----|

```
m = max(max(Z)) % màxim de tota la matriu
```

m = 10

```
Z(Z<5) = 0;
```

```
Z(Z>= 5) = 1
```

Z = 6×6

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 |

```

0    1    0    0    1    0
0    1    1    0    1    1

```

```
s = sum(Z) % suma per columnes
```

```

s = 1x6
    2    5    4    2    5    4

```

```
s = sum(sum(Z)) % nombre d'uns de la matriu
```

```
s = 22
```

```

% mesura del temps de calcul
x = rand([10000 1])

```

```

x = 10000x1
    0.8824
    0.2629
    0.9790
    0.9947
    0.4736
    0.8681
    0.6592
    0.3582
    0.2807
    0.4277
     ⋮

```

```

tic
e = x'*x

```

```
e = 3.3595e+03
```

```
toc
```

```
Elapsed time is 0.003216 seconds.
```

## Funcions pròpies

```
x = 1:1:100
```

```

x = 1x100
    1    2    3    4    5    6    7    8    9   10   11   12   13 ...

```

```
q = myfunction(x)
```

```

y = 100x100
    1    2    3    4    5    6    7    8    9   10   11   12   13 ...
    2    4    6    8   10   12   14   16   18   20   22   24   26
    3    6    9   12   15   18   21   24   27   30   33   36   39
    4    8   12   16   20   24   28   32   36   40   44   48   52
    5   10   15   20   25   30   35   40   45   50   55   60   65
    6   12   18   24   30   36   42   48   54   60   66   72   78
    7   14   21   28   35   42   49   56   63   70   77   84   91
    8   16   24   32   40   48   56   64   72   80   88   96  104
    9   18   27   36   45   54   63   72   81   90   99  108  117
   10   20   30   40   50   60   70   80   90  100  110  120  130

```

```

      :
      :
q = 100x100
      1      2      3      4      5      6      7      8      9     10     11     12     13 . . .
      2      4      6      8     10     12     14     16     18     20     22     24     26
      3      6      9     12     15     18     21     24     27     30     33     36     39
      4      8     12     16     20     24     28     32     36     40     44     48     52
      5     10     15     20     25     30     35     40     45     50     55     60     65
      6     12     18     24     30     36     42     48     54     60     66     72     78
      7     14     21     28     35     42     49     56     63     70     77     84     91
      8     16     24     32     40     48     56     64     72     80     88     96    104
      9     18     27     36     45     54     63     72     81     90     99    108    117
     10     20     30     40     50     60     70     80     90    100    110    120    130
      :
      :

```