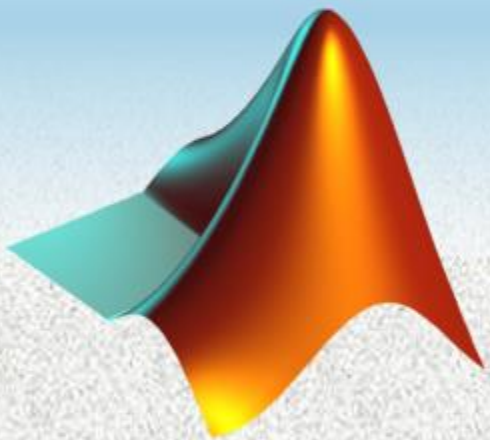
UNIVERSIDAD
NACIONAL DE
INGENIERÍA

MATLAB

R2017a



Maria Pimentel Herrera

uni.kernel@gmail.com

Operadores aritméticos

+	Adición
-	Sustracción
*	Multiplicación
/	División por la derecha
\	División por la izquierda
^	Potencia
'	transposión

.*	Multiplicación término a termino
./	División a la derecha término a termino
.\	División a la izquierda término a termino
.^	Potenciación término a termino

Crear submatrices de una matriz

A=magic(4)

```
A =

    16     2     3    13
     5    11    10     8
     9     7     6    12
     4    14    15     1
```

Ad=diag(A)

```
Ad =

    16
    11
     6
     1
```

U=triu(A)

```
U =

    16     2     3    13
     0    11    10     8
     0     0     6    12
     0     0     0     1
```

Ad=diag(diag(A))

```
Ad =

    16     0     0     0
     0    11     0     0
     0     0     6     0
     0     0     0     1
```

L=tril(A)

```
L =

    16     0     0     0
     5    11     0     0
     9     7     6     0
     4    14    15     1
```

M-File: s041.m

```
%matrix magic
A=magic(4)
%elementos de la diagonal
Ad=diag(A)
%matriz diagonal
Ad=diag(diag(A))
%triangular superior
U=triu(A)
%triangular inferior
L=tril(A)
```

A

```
A =

    16     2     3    13
     5    11    10     8
     9     7     6    12
     4    14    15     1
```

A2=fliplr(A)

```
A2 =

    13     3     2    16
     8    10    11     5
    12     6     7     9
     1    15    14     4
```

A3=flipud(A)

```
A3 =

     4    14    15     1
     9     7     6    12
     5    11    10     8
    16     2     3    13
```

sc=sum(A,1)

```
sc =

    34    34    34    34
```

sf=sum(A,2)

```
sf =

    34
    34
    34
    34
```

At=trace(A)

```
At =

    34
```

M-File: s042.m

```
A
%permuta columnas: izquierda a derecha
A2=fliplr(A)
%permuta filas: arriba hacia abajo
A3=flipud(A)
%suma de columna
sc=sum(A), sc=sum(A,1)
%suma de filas
sf=sum(A,2)
```

```
Y=7*ones(3)
```

```
Y =

     7     7     7
     7     7     7
     7     7     7
```

```
I=28*eye(3)
```

```
I =

    28     0     0
     0    28     0
     0     0    28
```

```
C1=cat(1,Y,I)
```

```
C1 =

     7     7     7
     7     7     7
     7     7     7
    28     0     0
     0    28     0
     0     0    28
```

```
C2=cat(2,Y,I)
```

```
C2 =

     7     7     7    28     0     0
     7     7     7     0    28     0
     7     7     7     0     0    28
```

MB=blkdiag(Y,C1)

```
MB =

     7     7     7     0     0     0
     7     7     7     0     0     0
     7     7     7     0     0     0
     0     0     0     7     7     7
     0     0     0     7     7     7
     0     0     0     7     7     7
     0     0     0    28     0     0
     0     0     0     0    28     0
     0     0     0     0     0    28
```

K=repmat([-1 22;31 49],2,3)

```
K =

    -1    22    -1    22    -1    22
    31    49    31    49    31    49
    -1    22    -1    22    -1    22
    31    49    31    49    31    49
```

M-File: s043.m

```
%matriz de sietes, orden 3
Y=7*ones(3)
%matriz diagonal 28, orden 3
I=28*eye(3)
%concatenación vertical
C1=[Y;I], C1=cat(1,Y,I), C1=vertcat(Y,I)
%concatenación horizontal
C2=[Y I], C2=cat(2,Y,I), C2=horzcat(Y,I)
```

M-File: s043.m

```
%matriz diagonal por bloques
MB=blkdiag(Y,C1)
%crea nueva matriz de copias
K=repmat([-1 22;31 49],2,3)
```

```
C=[1:5;6:10;11:15]
```

```
C =

     1     2     3     4     5
     6     7     8     9    10
    11    12    13    14    15
```

```
D=linspace(1,23,12)
```

```
D =

     1     3     5     7     9    11    13    15    17    19    21    23
```

```
C(:)
```

```
ans =

     1
     6
    11
     2
     7
    12
     3
     8
    13
     4
     9
    14
     5
    10
    15
```

```
reshape(D,3,4)
```

```
ans =

     1     7    13    19
     3     9    15    21
     5    11    17    23
```

M-File: s044.m

```
%matriz 3x5, números consecutivos
C=[1:5;6:10;11:15]
%matriz como vector vertical
C(:)
%vector horizontal de 12 elementos
D=linspace(1,23,12)
%vector convertido en matriz
reshape(D,3,4)
```

```
M=reshape(3:2:42,4,5)
```

```
M =

     3    11    19    27    35
     5    13    21    29    37
     7    15    23    31    39
     9    17    25    33    41
```

```
M(end)=100
```

```
M =

     3    11    19    27    35
     5    13    21    29    37
     7    15    23    31    39
     9    17    25    33   100
```

```
M(2,1:4)=zeros(1,4)
```

```
M =

     3    11    19    27    35
     0     0     0     0    37
     7    15    23    31    39
     9    17    25    33   100
```

```
M(:,3)=55*ones(4,1)
```

```
M =

     3    11    55    27    35
     0     0    55     0    37
     7    15    55    31    39
     9    17    55    33   100
```

```
M(:,2)=[]
```

```
M =

     3    55    27    35
     0    55     0    37
     7    55    31    39
     9    55    33   100
```

M-File: s045.m

```
%matriz a partir de un vector
M=reshape(3:2:42,4,5)
%cambiando el ultimo valor por 100
M(end)=100
%fila 2 hasta columna 4 x cero
M(2,1:4)=zeros(1,4) %M(2,1:4)=0
%columna 3 cambiar por 55
M(:,3)=55*ones(4,1) %M(:,3)=55
%Eliminar columna 2
M(:,2)=[]
```

Análisis de matriz

M-File: s046.m

```
clc; A=magic(3); B=magic(4);
%rango de matrices
A
fprintf('rango matriz A: %0.0f\n\n',rank(A));
disp('reducción en forma escalonada')
disp(rref(A))
B
fprintf('rango matriz B: %0.0f\n\n',rank(B));
disp('reducción en forma escalonada')
disp(rref(B))
```

```
A=[5 4 2; 4 5 2; 2 2 2]
```

```
A =

     5     4     2
     4     5     2
     2     2     2
```

```
fprintf('determinante(A)=%0.0f\n\n',det(A));
```

```
determinante(A)= 10
```

```
pA=poly(A)
% h^3-12h^2+21h-10
```

```
pA =

     1   -12    21   -10
```

```
h=polyeig(A)
```

```
h =

    10
     1
     1
```

```
[V,D]=eig(A)
```

```
V =

    751/2192     374/565       2/3
    473/3843   -1013/1378      2/3
  -1113/1195     329/2248      1/3
```

```
D =

    10     0     0
     0     1     0
     0     0     1
```

M-File: s047.m

```
clc; A=[5 4 2; 4 5 2; 2 2 2]
format rat
%determinante de matrices
fprintf('determinante(A)= %0.0f\n\n',det(A));
%polinomio característico p(h)=det(A-hI)=0
pA=poly(A)
%valores propios h
h=polyeig(A)
%vectores y valores propios en matriz
[V,D]=eig(A)
```

Análisis de datos

```
x=[8  9  1  -8  4]'
```

```
sum(x)
```

```
cumsum(x)
```

```
prod(x)
```

```
cumprod(x)
```

```
x =

     8
     9
     1
    -8
     4

suma = 14

suma acumulada
     8
    17
    18
    10
    14

producto = -2304

producto acumulada
     8
    72
    72
  -576
 -2304
```

M-File: s048.m

```
%Análisis de datos
x=[8 9 1 -8 4]'
%suma de elementos
fprintf('suma = %0.0f\n\n',sum(x));
%suma acumulada
disp('suma acumulada'); disp(cumsum(x));
%producto de elementos
fprintf('producto = %0.0f\n\n',prod(x));
%producto acumulado
disp('producto acumulada'); disp(cumprod(x));
%ordenar vector
sort(x,'descend')
```

```
max(x)
```

```
valor máximo = 9

valor mínimo = -8

ordenando descendente
     9
     8
     4
     1
    -8
```

```
sort(x,'ascend')
```

```
mean(x)
```

```
min(x)
```

```
median(x)
```

```
sort(x,'descend')
```

```
mode(x)
```

```
ordenando ascendente
    -8
     1
     4
     8
     9

promedio = 3

mediana = 4

moda = -8
```

M-File: s049.m

```
%valor máximo
fprintf('valor máximo = %0.0f\n\n',max(x));
%valor mínimo
fprintf('valor mínimo = %0.0f\n\n',min(x));
%ordenar vector
disp('ordenando descendente'); disp(sort(x,'descend'))
disp('ordenando ascendente'); disp(sort(x,'ascend'))
%promedio
fprintf('promedio = %0.0f\n\n',mean(x));
%mediana
fprintf('mediana = %0.0f\n\n',median(x));
%moda
fprintf('moda = %0.0f\n\n',mode(x));
```

Salida de datos

fprintf

- Ángulo en radianes

```
ángulos conocidos
ángulos :     pi/6      pi/4      pi/3
f. sen  :     0.50      0.71      0.87
f. cos  :     0.87      0.71      0.50
f. tan  :     0.58      1.00      1.73
f. ctan :     1.73      1.00      0.58
f. sec  :     1.15      1.41      2.00
f. csec :     2.00      1.41      1.15
```

M-File: s0410.m

```
clc
%funciones trigonométricas
disp('ángulos conocidos');
v=[pi/6 pi/4 pi/3];
disp('ángulos :    pi/6     pi/4     pi/3');
fprintf('f. sen  :%8.2f %8.2f %8.2f\n',sin(v(1)),sin(v(2)),sin(v(3)));
fprintf('f. cos  :%8.2f %8.2f %8.2f\n',cos(v(1)),cos(v(2)),cos(v(3)));
fprintf('f. tan  :%8.2f %8.2f %8.2f\n',tan(v(1)),tan(v(2)),tan(v(3)));
fprintf('f. ctan :%8.2f %8.2f %8.2f\n',cot(v(1)),cot(v(2)),cot(v(3)));
fprintf('f. sec  :%8.2f %8.2f %8.2f\n',sec(v(1)),sec(v(2)),sec(v(3)));
fprintf('f. csec :%8.2f %8.2f %8.2f\n',csc(v(1)),csc(v(2)),csc(v(3)));
```

fprintf

- Ángulo sexagesimales

```
ángulos conocidos
ángulos :     30        45        60
f. sen  :    0.50      0.71      0.87
f. cos  :    0.87      0.71      0.50
f. tan  :    0.58      1.00      1.73
f. ctan :    1.73      1.00      0.58
f. sec  :    1.15      1.41      2.00
f. csec :    2.00      1.41      1.15
```

M-File: s0411.m

```
clc
%funciones trigonométricas
disp('ángulos conocidos');
v=[30 45 60];
disp('ángulos :     30       45       60');
fprintf('f. sen  :%8.2f %8.2f %8.2f\n',sind(v(1)),sind(v(2)),sind(v(3)));
fprintf('f. cos  :%8.2f %8.2f %8.2f\n',cosd(v(1)),cosd(v(2)),cosd(v(3)));
fprintf('f. tan  :%8.2f %8.2f %8.2f\n',tand(v(1)),tand(v(2)),tand(v(3)));
fprintf('f. ctan :%8.2f %8.2f %8.2f\n',cotd(v(1)),cotd(v(2)),cotd(v(3)));
fprintf('f. sec  :%8.2f %8.2f %8.2f\n',secd(v(1)),secd(v(2)),secd(v(3)));
fprintf('f. csec :%8.2f %8.2f %8.2f\n',cscd(v(1)),cscd(v(2)),cscd(v(3)));
```

fprintf

- Ángulo sexagesimales

```
ángulo 30°
f. sen(30°)=0.50
f. cos(30°)=0.87
f. tan(30°)=0.58
f. ctan(30°)=1.73
f. sec(30°)=1.15
f. csec(30°)=2.00
```

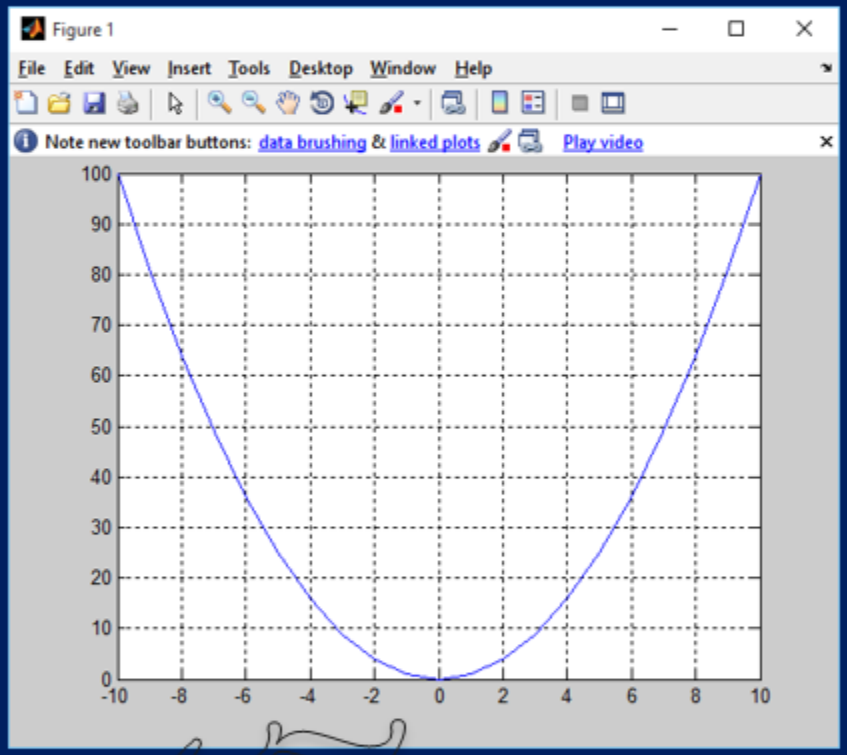
M-File: s0412.m

```
clc
%funciones trigonométricas
disp('ángulo 30°');
v=30;
fprintf('f. sen(%0.0f°)=%1.2f\n',v,sind(v));
fprintf('f. cos(%0.0f°)=%1.2f\n',v,cosd(v));
fprintf('f. tan(%0.0f°)=%1.2f\n',v,tand(v));
fprintf('f. ctan(%0.0f°)=%1.2f\n',v,cotd(v));
fprintf('f. sec(%0.0f°)=%1.2f\n',v,secd(v));
fprintf('f. csec(%0.0f°)=%1.2f\n',v,cscd(v));
```

Gráficos

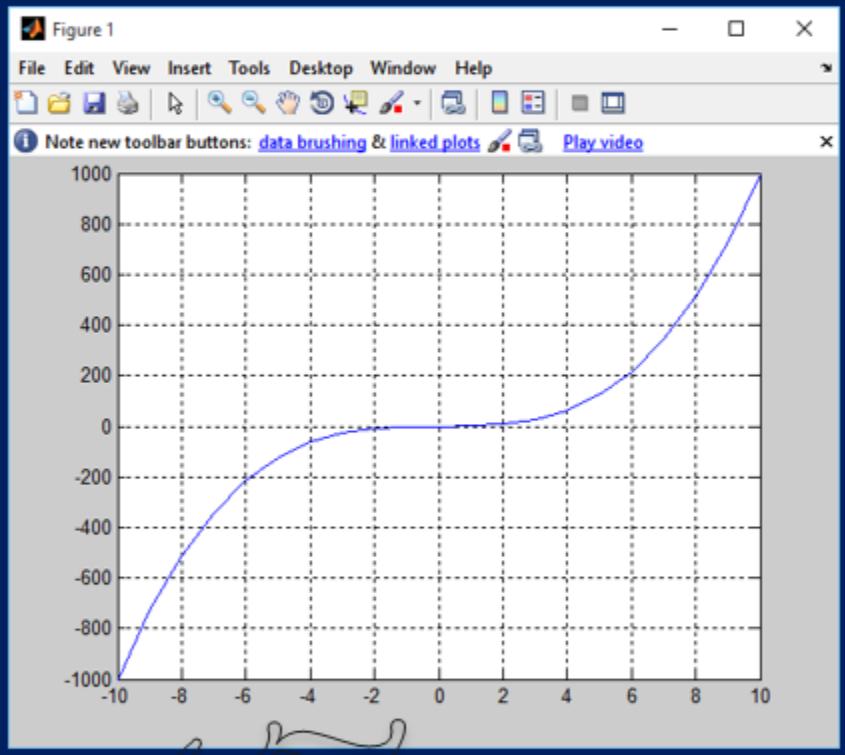
M-File: s0413.m

```
x=-10:10;
y=x.^2;
plot(x,y)
grid
```



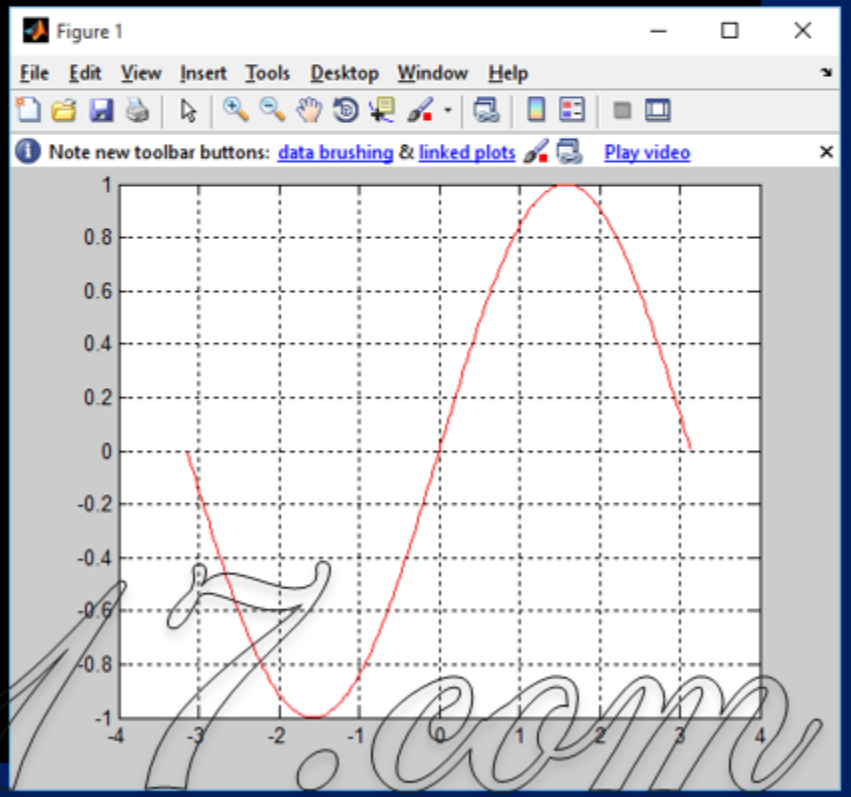
M-File: s0414.m

```
x=-10:10;
y=x.^3;
plot(x,y)
grid
```



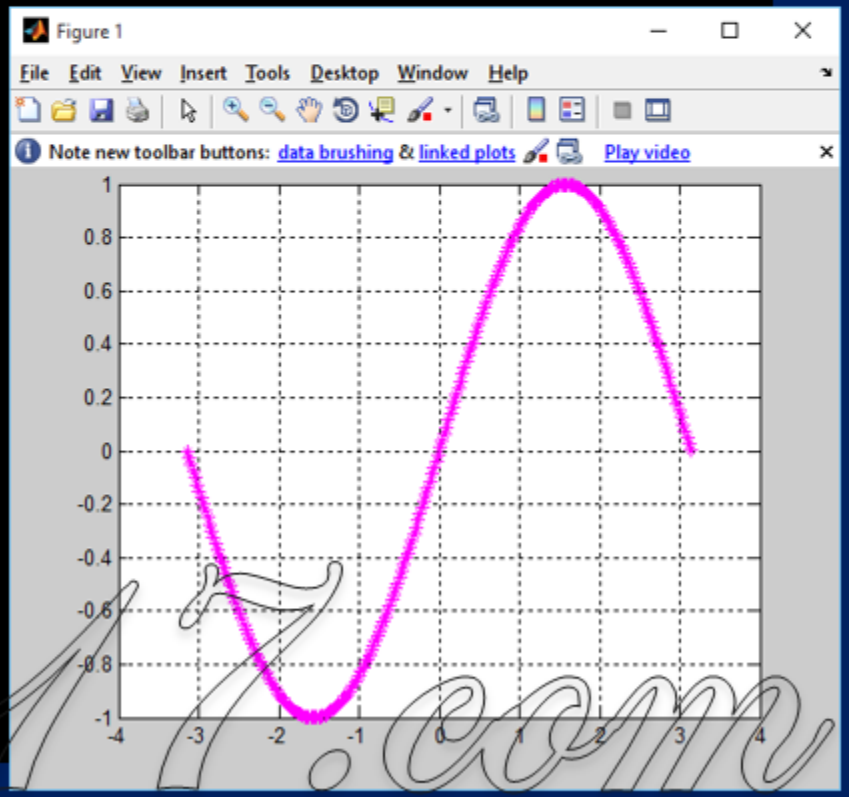
M-File: s0415.m

```
x=linspace(-pi,pi,250);
y=sin(x);
plot(x,y,'r')
grid
```



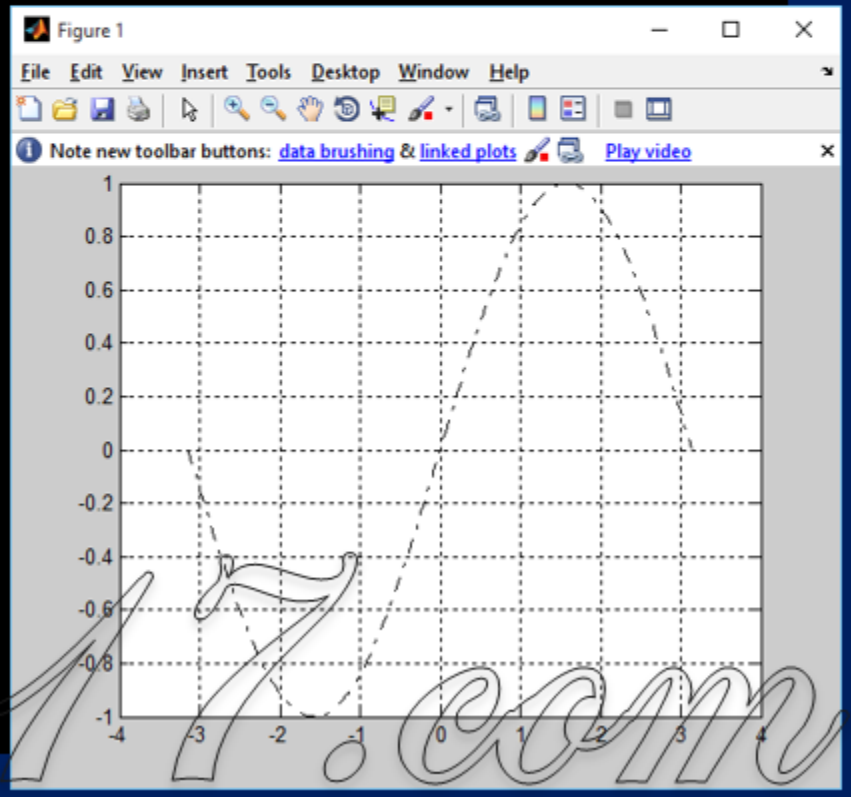
M-File: s04152.m

```
x=linspace(-pi,pi,250);
y=sin(x);
plot(x,y,'m*')
grid
```



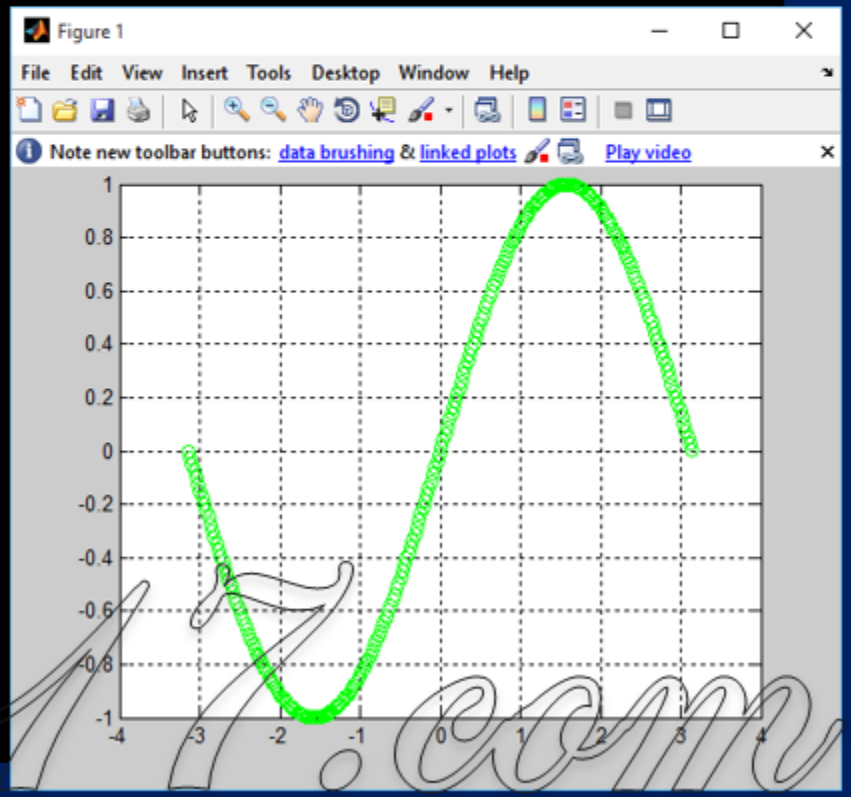
M-File: s04153.m

```
x=linspace(-pi,pi,250);
y=sin(x);
plot(x,y,'k-.')
grid
```



M-File: s04154.m

```
x=linspace(-pi,pi,250);
y=sin(x);
plot(x,y,'go')
grid
```



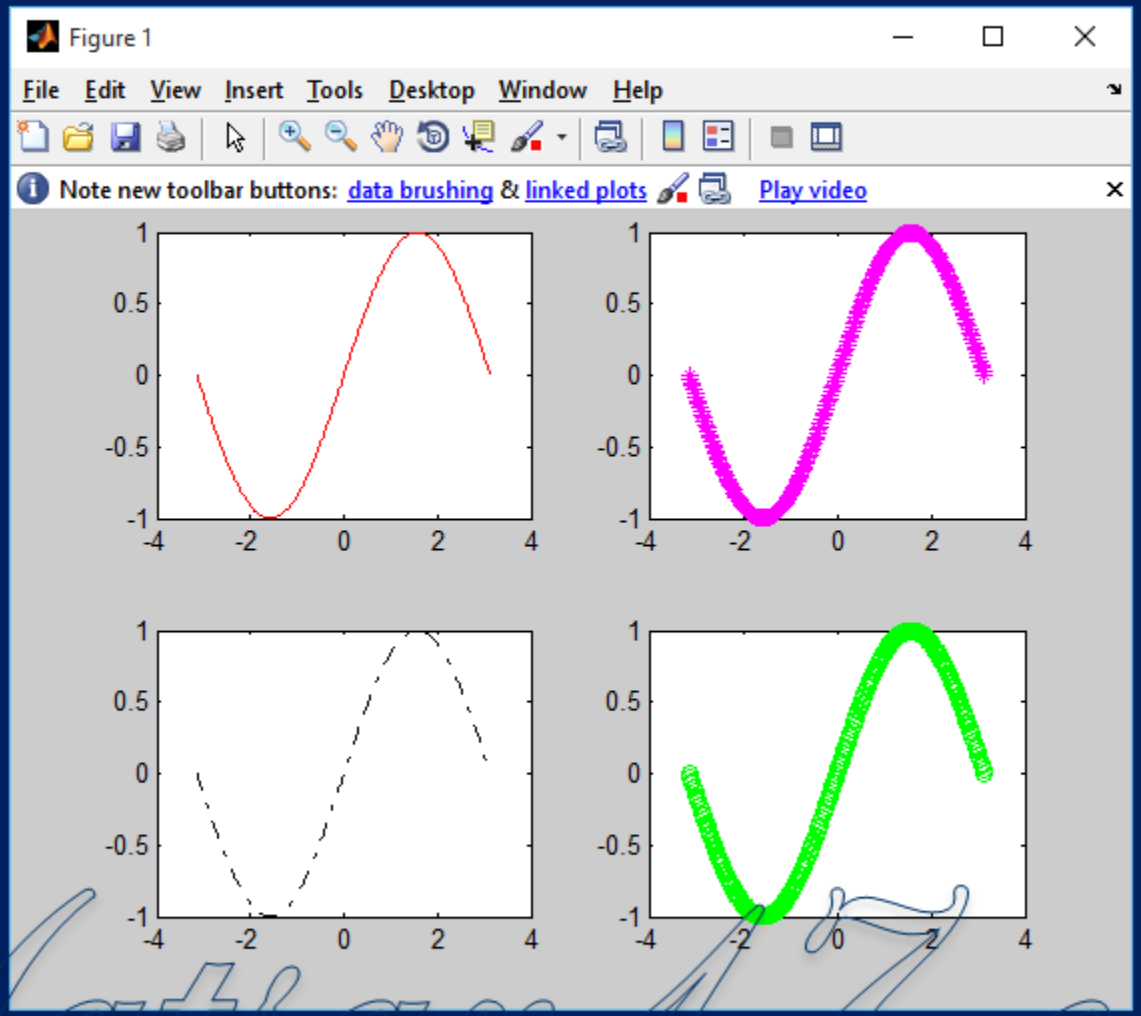


Figure 1
File Edit View Insert Tools Desktop Window Help
Note new toolbar buttons: data brushing & linked plots Play video
1
0.5
0
-0.5
-1
-4 -2 0 2 4

M-File: s04155.m

```
subplot(1,1,1)
x=linspace(-pi,pi,250);
y=sin(x);
subplot(2,2,1), plot(x,y,'r')
subplot(2,2,2), plot(x,y,'m*')
subplot(2,2,3), plot(x,y,'k-.')
subplot(2,2,4), plot(x,y,'go')
```

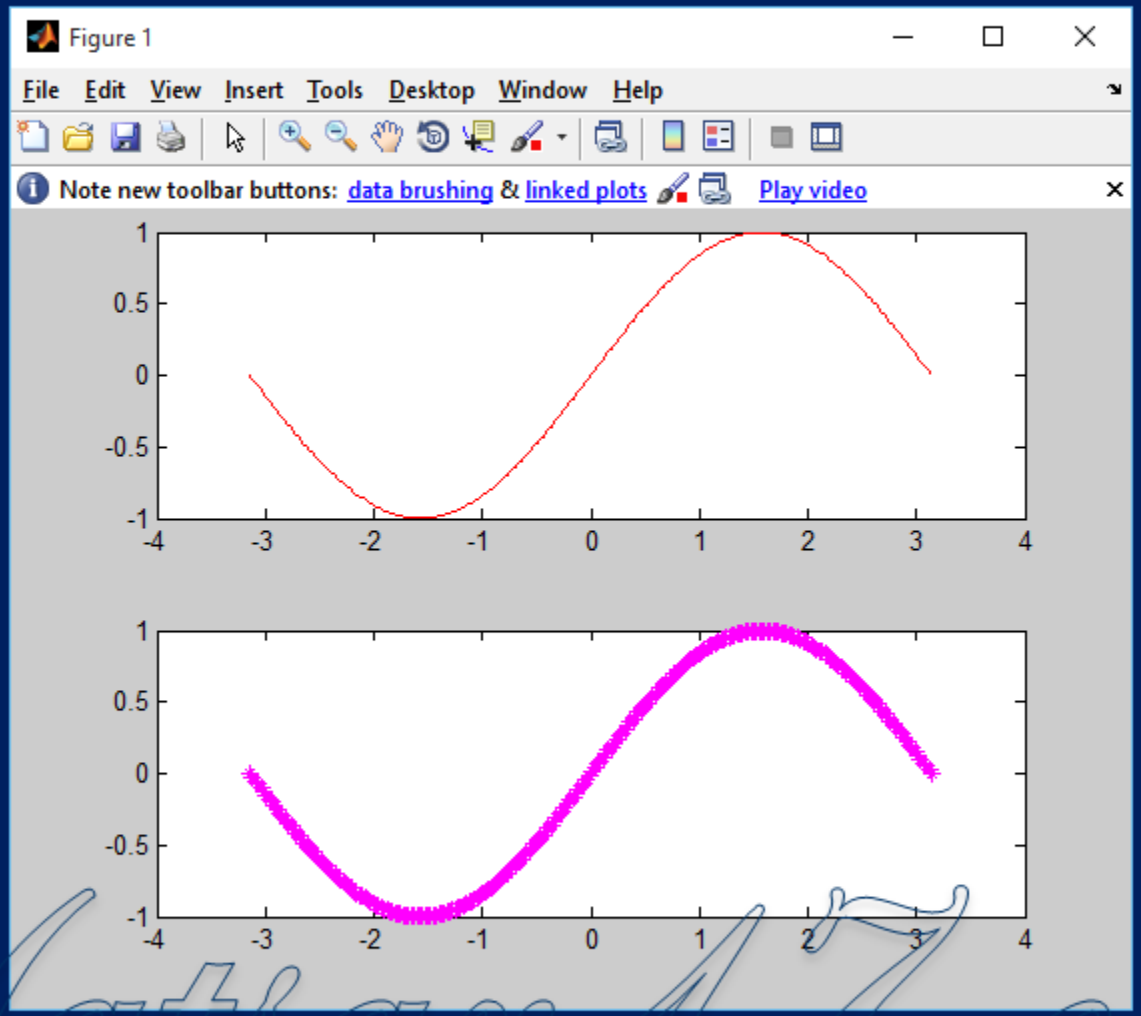


Figure 1
File Edit View Insert Tools Desktop Window Help
Note new toolbar buttons: data brushing & linked plots Play video
1
0.5
0
-0.5
-1
-4 -3 -2 -1 0 1 2 3 4
1
0.5
0
-0.5
-1
-4 -3 -2 -1 0 1 2 3 4

M-File: s04156.m

```
subplot(1,1,1)
x=linspace(-pi,pi,250);
y=sin(x);
subplot(2,1,1), plot(x,y,'r')
subplot(2,1,2), plot(x,y,'m*')
```

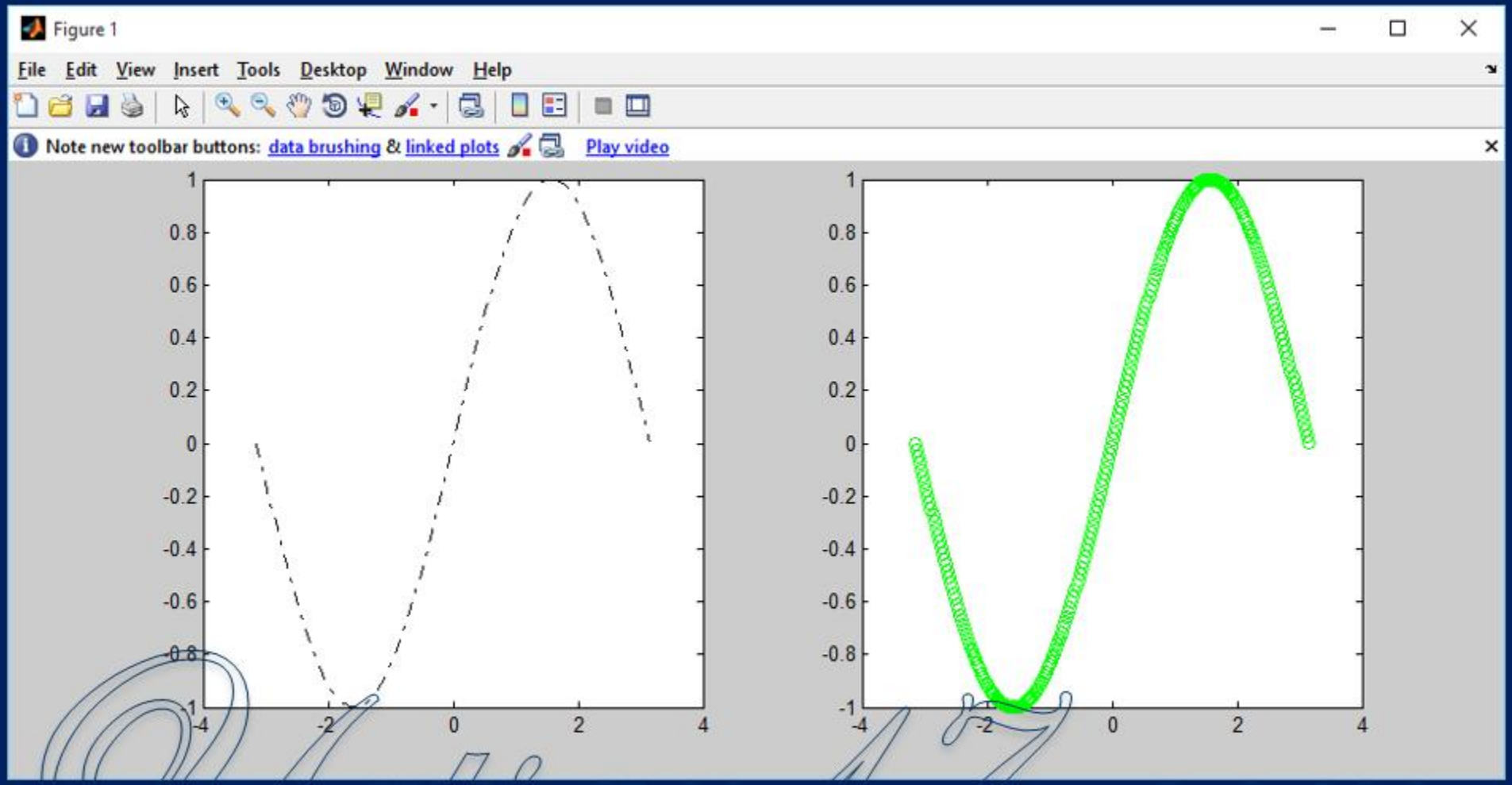


Figure 1
File Edit View Insert Tools Desktop Window Help
Note new toolbar buttons: data brushing & linked plots Play video
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-4
-2
0
2
4

M-File: s04157.m

```
subplot(1,1,1)
x=linspace(-pi,pi,250);
y=sin(x);
subplot(1,2,1), plot(x,y,'k-.')
subplot(1,2,2), plot(x,y,'go')
```