Matlab

ismertető

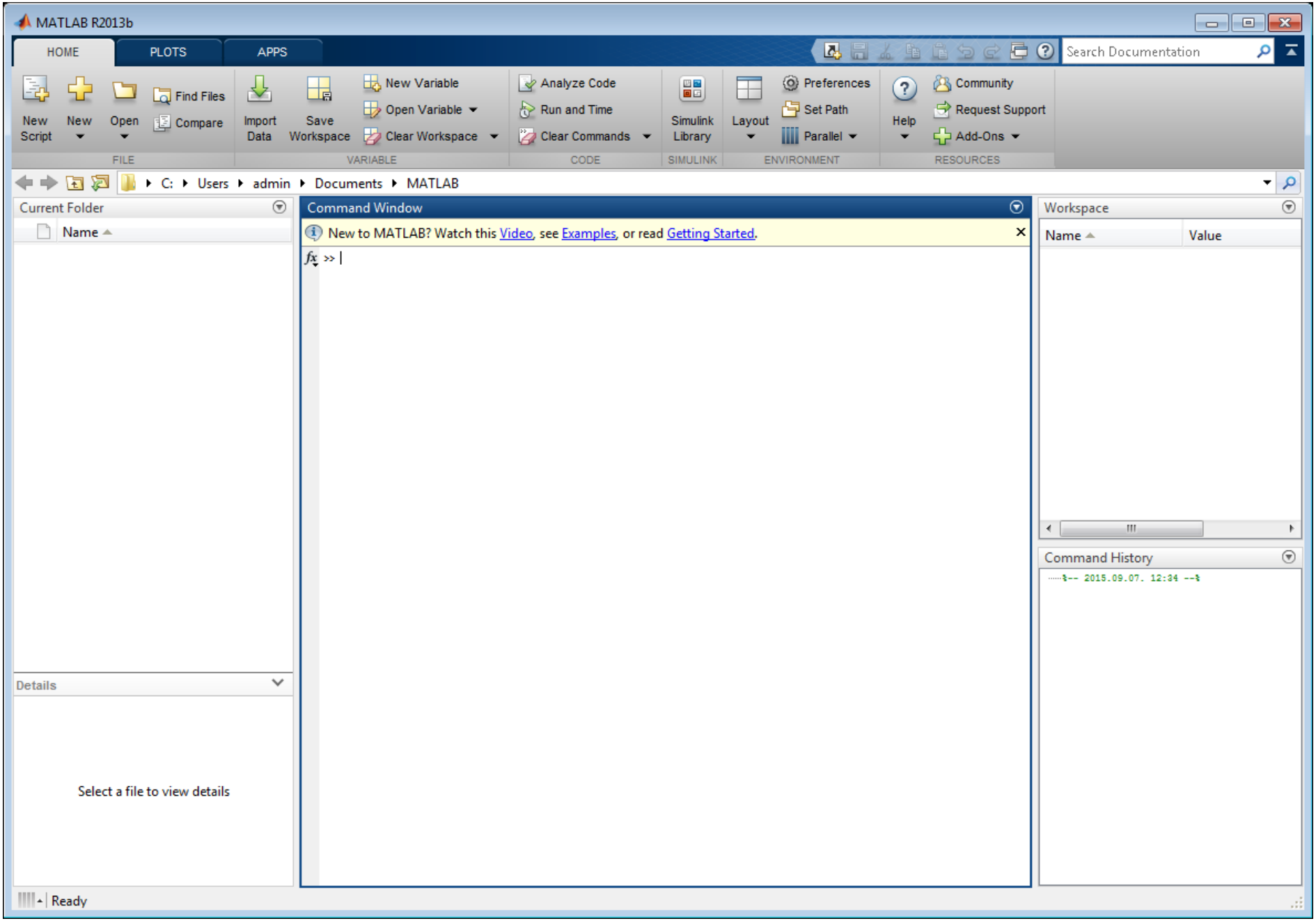
2016 ősz

Követelményrendszer

- Előadás: 2db zh (félév közepén és a végén)
- Gyakorlat: 1db zh az utolsó órán
- A gyakorlati zh-n legalább 50%-ot kell elérni!
- Elméleti zh-k átlaga alapján az évközi jegy:
  - 89-100% jeles
  - 76-88% jó
  - 63-75% közepes
  - 51-62% elégséges
  - 0-50% elégtelen
- Pótlás: TVSz szerint a vizsgaidőszakban

Ajánlott irodalom:

- S. Gisbert: MATLAB, Typotex Kft, Budapest, 2005, ISBN 963 9548 49 9
  - *(Google Books)*


MATLAB R2013b
HOME
PLOTS
APPS
Search Documentation
New Script
New
Open
Find Files
Compare
Import Data
Save Workspace
New Variable
Open Variable
Clear Workspace
Analyze Code
Run and Time
Clear Commands
Simulink Library
Layout
Preferences
Set Path
Parallel
Help
Community
Request Support
Add-Ons
FILE
VARIABLE
CODE
SIMULINK
ENVIRONMENT
RESOURCES
C: ▸ Users ▸ admin ▸ Documents ▸ MATLAB
Current Folder
Name
Command Window
New to MATLAB? Watch this Video, see Examples, or read Getting Started.
>>
Workspace
Name
Value
Command History
%-- 2015.09.07. 12:34 --%
Details
Select a file to view details
Ready

Értékadás

```
>> a=10
a =
   10

>> A=1
A =
    1

>> A+a
ans =
   11
```

```
>> a= [0,1,2]
a =
     0     1     2

>> a= [0,1,2]'
a =
     0
     1
     2
```

```
>> M=[1,2,3;4,5,6;7,8,9]

M =

     1     2     3
     4     5     6
     7     8     9
```

```
>> a= [0:0.1:1]’
a =
         0
    0.1000
    0.2000
    0.3000
    0.4000
    0.5000
    0.6000
    0.7000
    0.8000
    0.9000
    1.0000
```

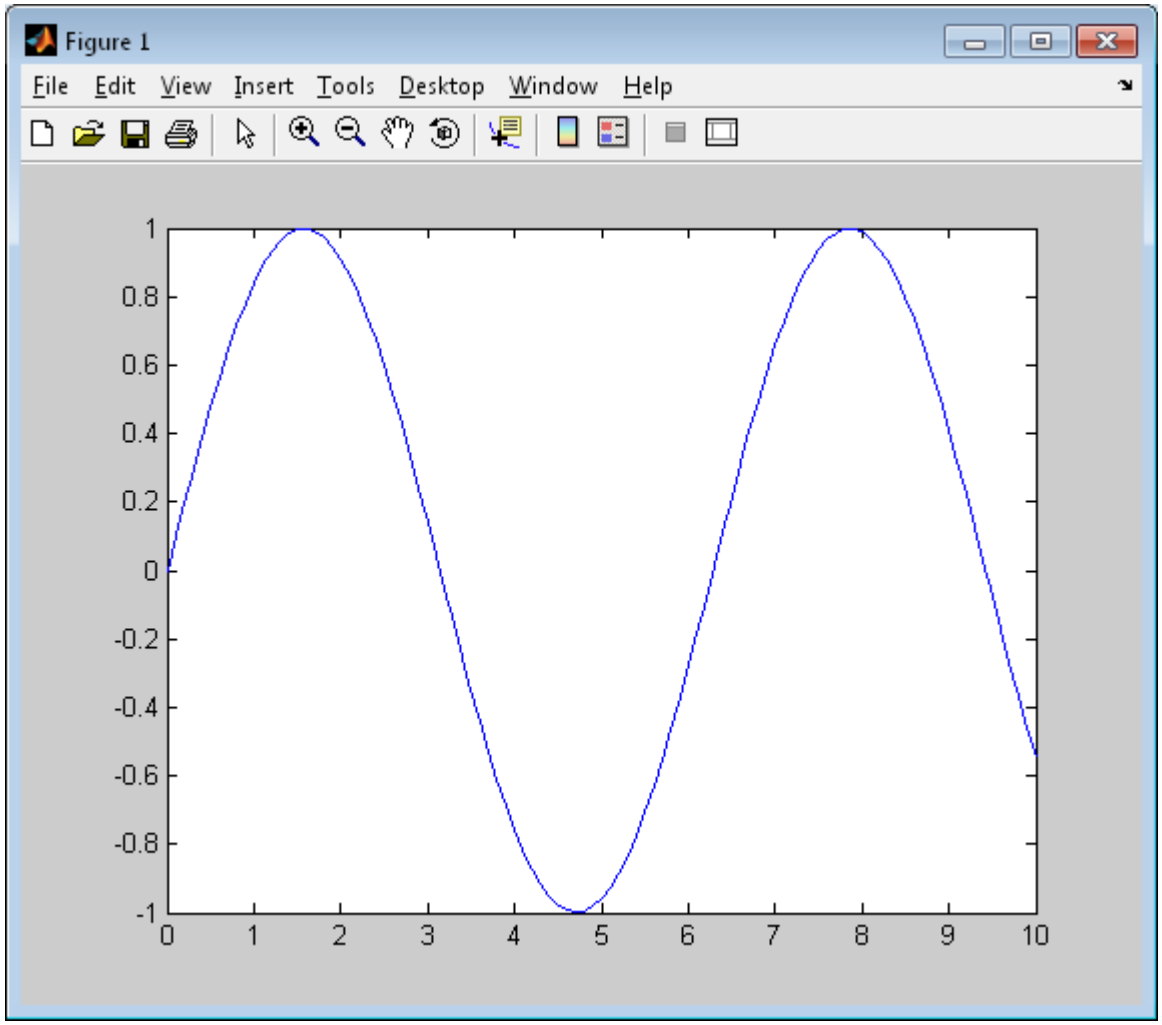
```
>> ones(3)
ans =
     1     1     1
     1     1     1
     1     1     1

>> zeros(3)
ans =
     0     0     0
     0     0     0
     0     0     0
```

```
>> length(a)
ans =
    11

>> b=-1
b =
    -1

>> abs(b)
ans =
     1
```

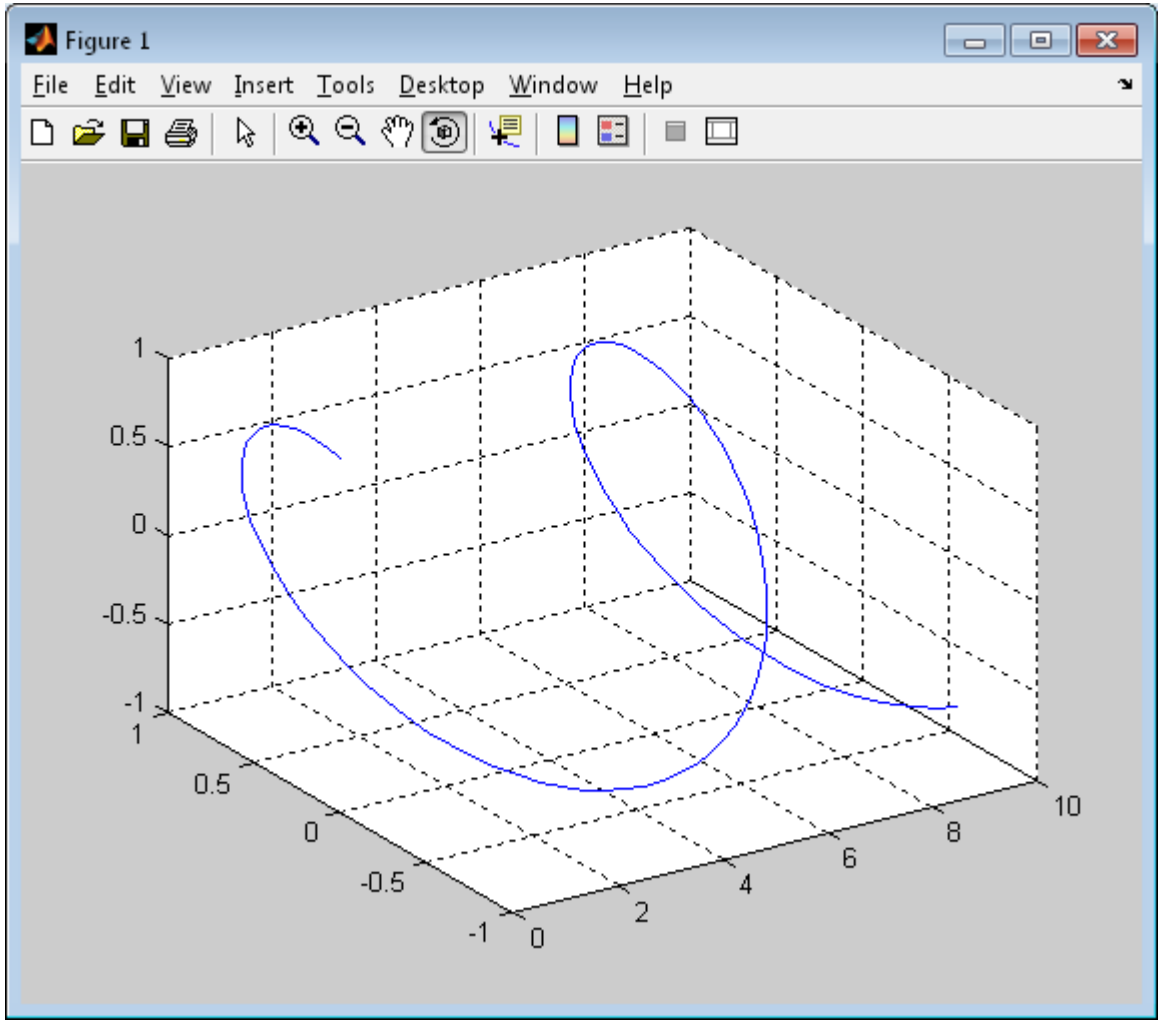
```
>> a = rand(3)
a =
    0.9649    0.9572    0.1419
    0.1576    0.4854    0.4218
    0.9706    0.8003    0.9157

>> a=a*10
a =
    9.6489    9.5717    1.4189
    1.5761    4.8538    4.2176
    9.7059    8.0028    9.1574
```

```
>> a = rand(3,1)
a =
    0.0357
    0.8491
    0.9340

>> a=a*10
a =
    0.3571
    8.4913
    9.3399

>> min(a)
ans =
    0.3571

>> max(a)
ans =
    9.3399

>> size(a)
ans =
     3     3
```

```
x=[0:0.1:10];
y=sin(x);
plot(x,y);
```



```
x=[0:0.1:10];
y=sin(x);
plot(x,y);
z=cos(x);
plot3(x,y,z);
grid
```



Plot tulajdonságok

```
plot(x,y,'-');
plot(x,y,'.');
plot(x,y,'+');
plot(x,y,'*');
```

```
plot(x,y,'- ');
plot(x,y,'--');
plot(x,y,'-+');
plot(x,y,'-*');
plot(x,y,'-o');
plot(x,y,'-s');
plot(x,y,'--o');
plot(x,y,'--s');
```

Plot tulajdonságok

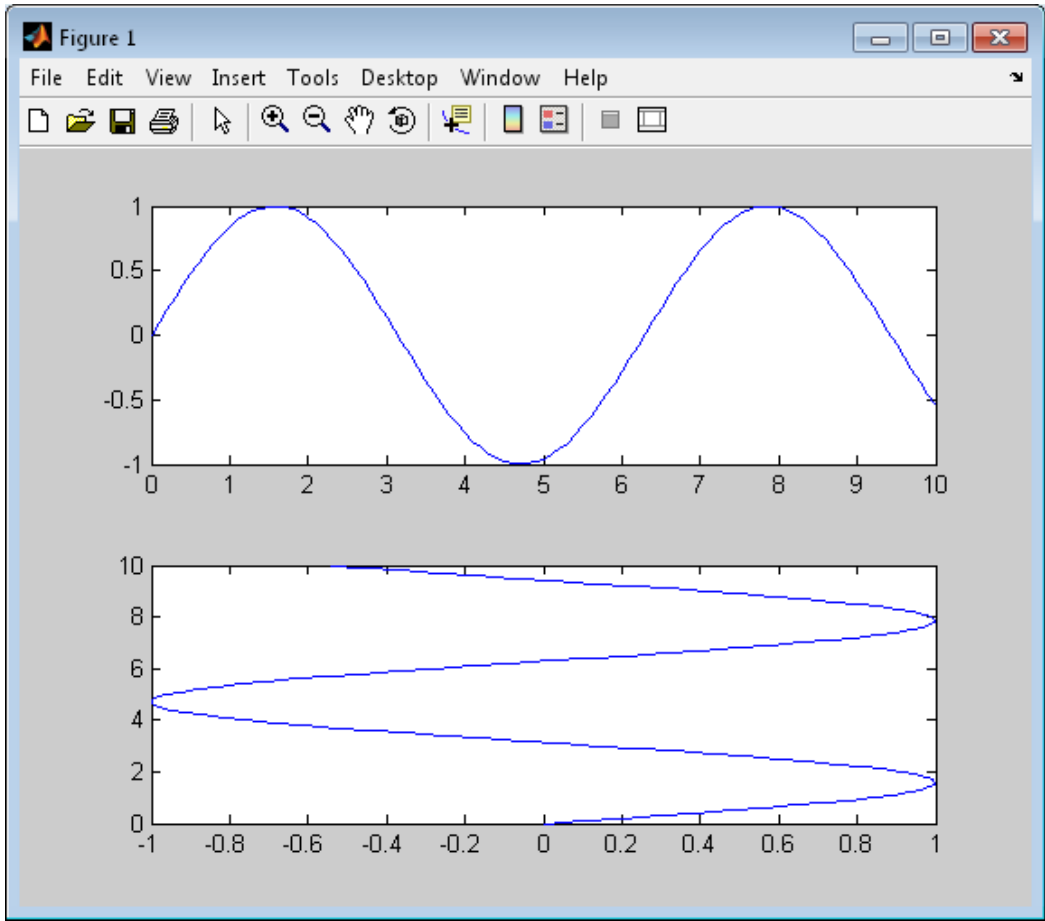
```
plot(x,y,'-+r');
plot(x,y,'-+g');
plot(x,y,'-+b');
plot(x,y,'-+k');

plot(x,y,'-+k', 'LineWidth',2);

 plot(x,y,'-ko', 'LineWidth',2,'MarkerEdgeColor','k',
    'MarkerFaceColor','g','MarkerSize',10)
```

Plot tulajdonságok

```
xlabel('X axis');
ylabel('Y axis');

ylim([-0.2 0.5]);
xlim([2 3.5]);
```

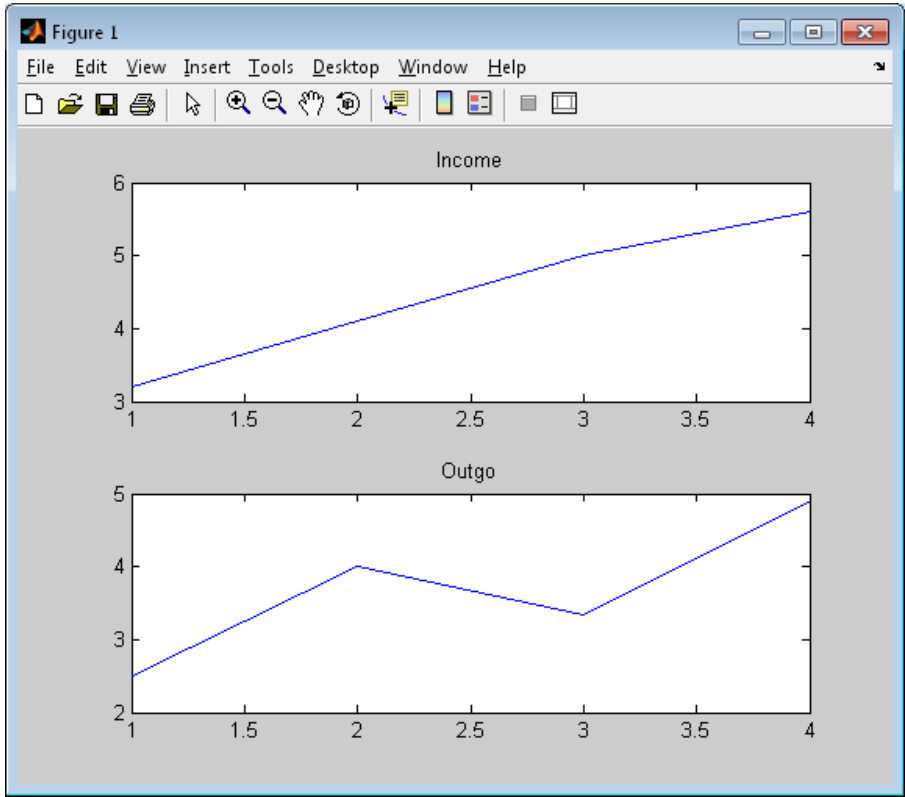
Subplot

```
subplot(2,1,1), plot(x, y);
subplot(2,1,2), plot(y, x);
```



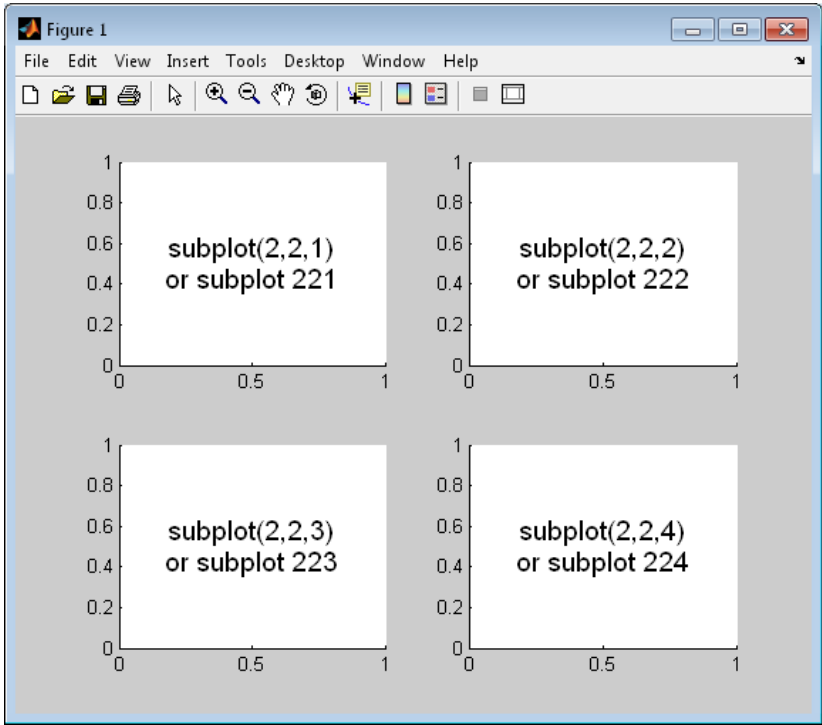
Subplot példa

```
>> income = [3.2,4.1,5.0,5.6];
outgo = [2.5,4.0,3.35,4.9];
subplot(2,1,1); plot(income)
title('Income')
subplot(2,1,2); plot(outgo)
title('Outgo')
```

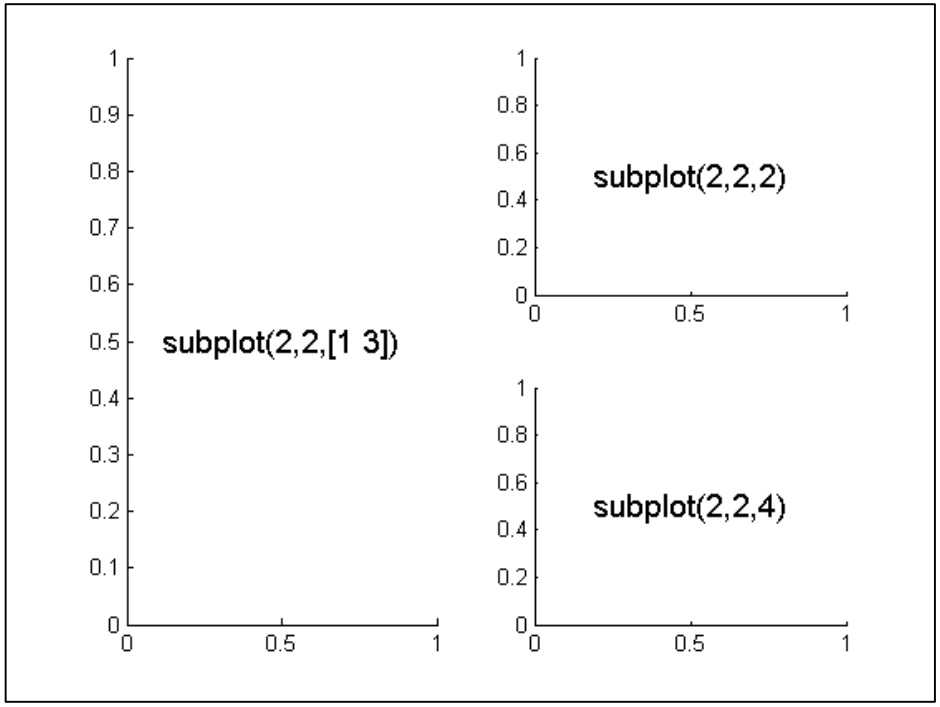


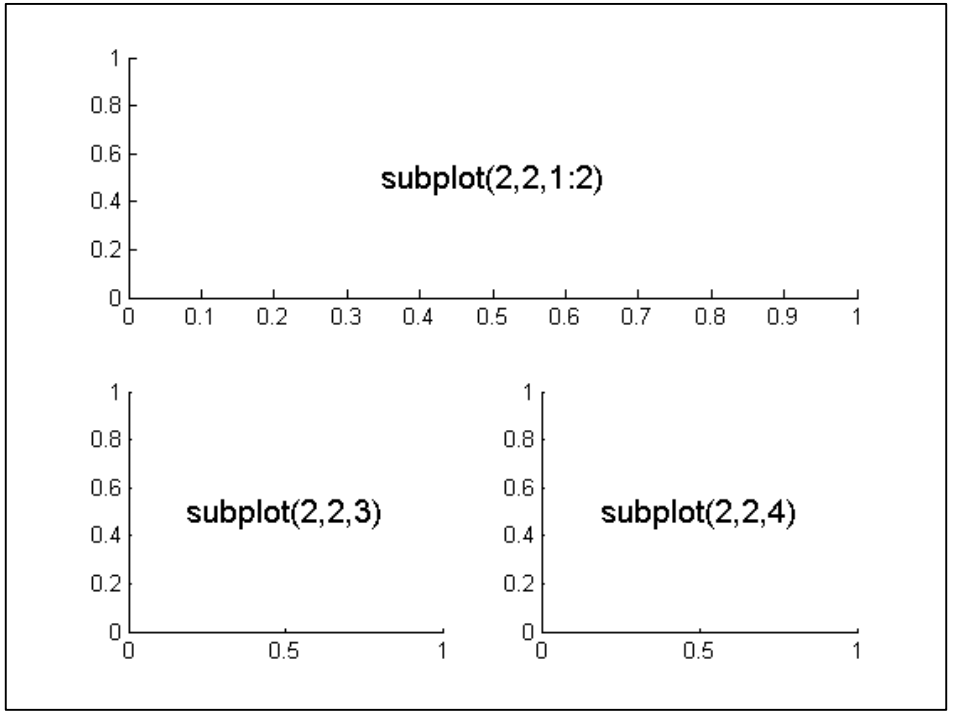
Subplot példa

```
>> figure
subplot(2,2,1)
text(.5,.5,{'subplot(2,2,1)';'or subplot 221'},...
    'FontSize',14,'HorizontalAlignment','center')
subplot(2,2,2)
text(.5,.5,{'subplot(2,2,2)';'or subplot 222'},...
    'FontSize',14,'HorizontalAlignment','center')
subplot(2,2,3)
text(.5,.5,{'subplot(2,2,3)';'or subplot 223'},...
    'FontSize',14,'HorizontalAlignment','center')
subplot(2,2,4)
text(.5,.5,{'subplot(2,2,4)';'or subplot 224'},...
    'FontSize',14,'HorizontalAlignment','center')
```



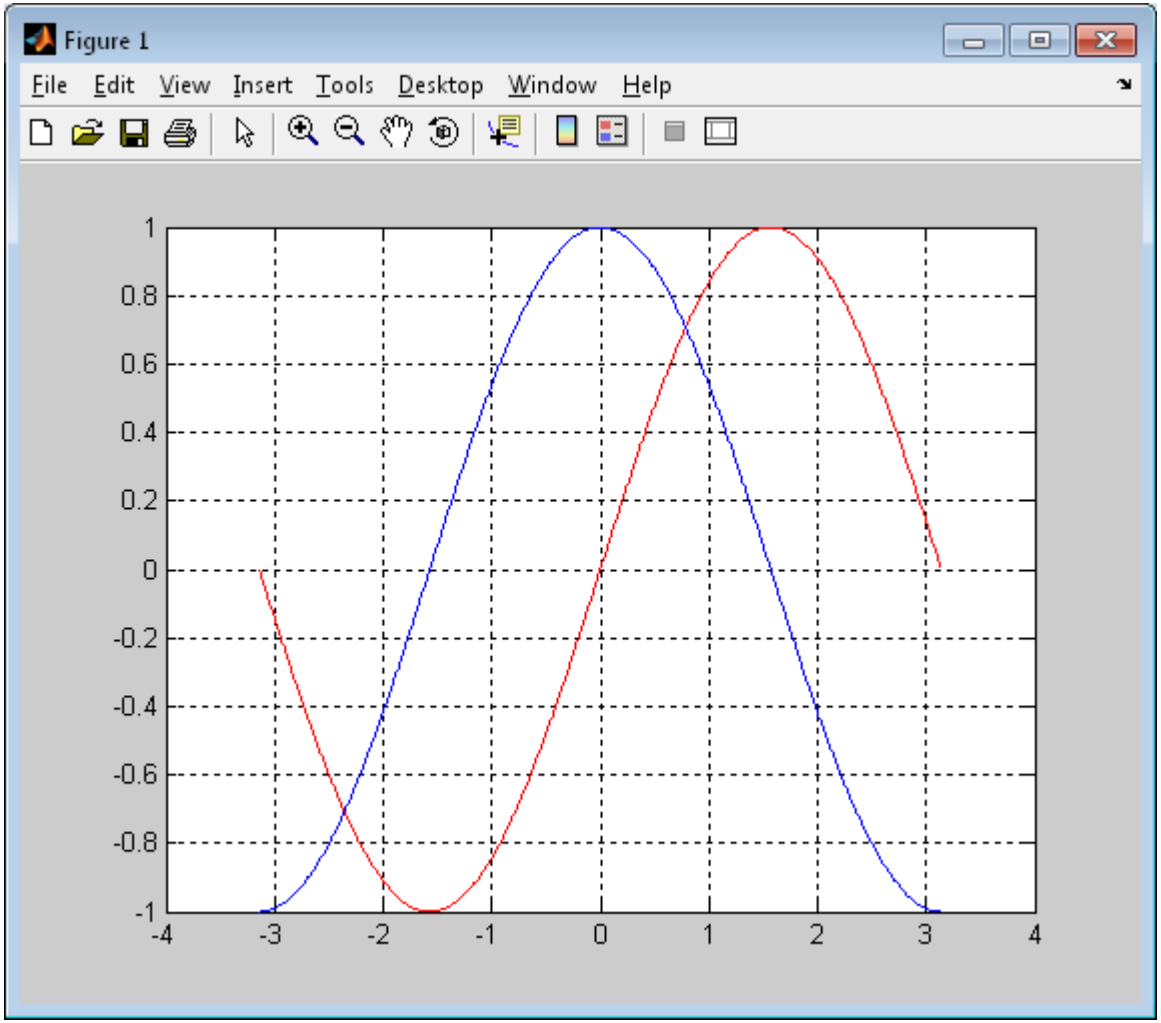
Subplot példa





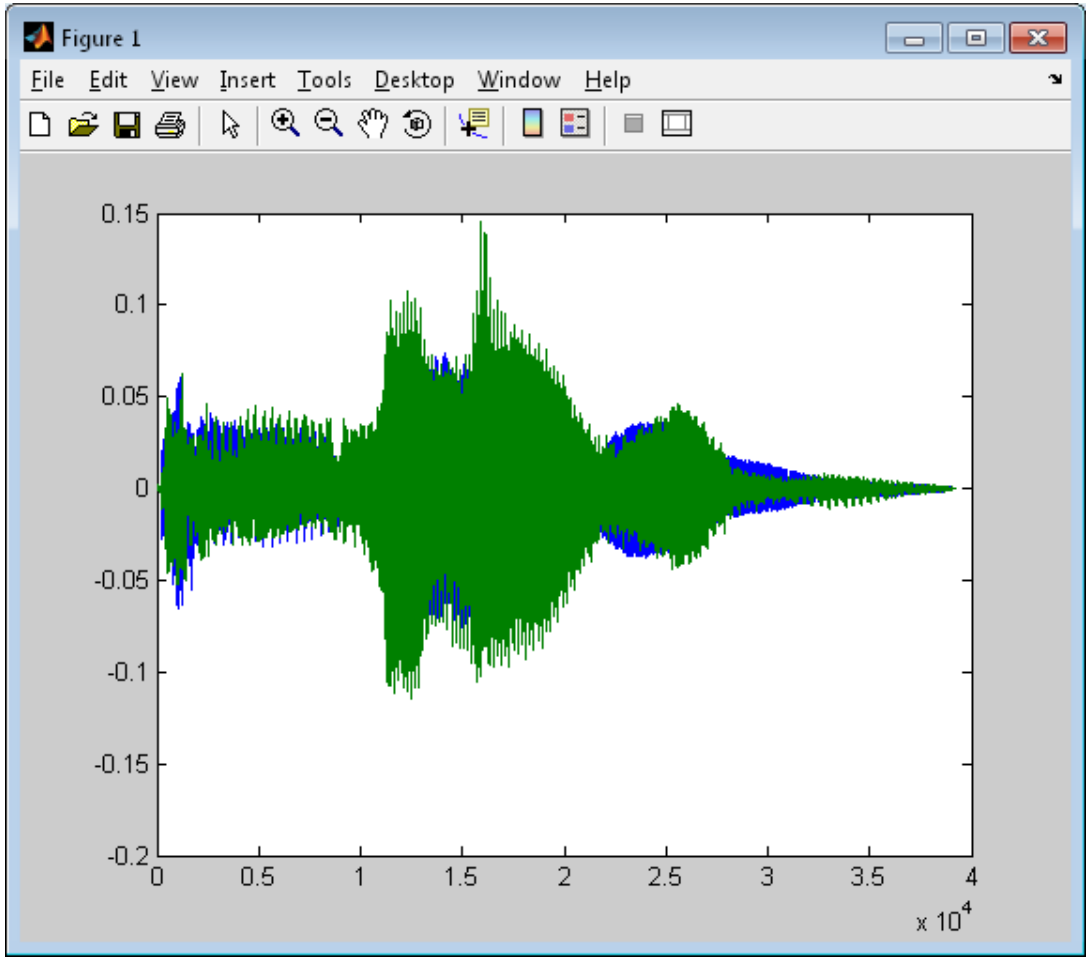
Hold

```
x=[-pi:0.01:pi];
y1=sin(x);
y2=cos(x);
plot(x,y1,'-r')
hold on
plot(x,y2,'-b')
grid
```



Hangok

```
[x, fs] = wavread('win.wav');
sound(x, fs);
plot(x);
```

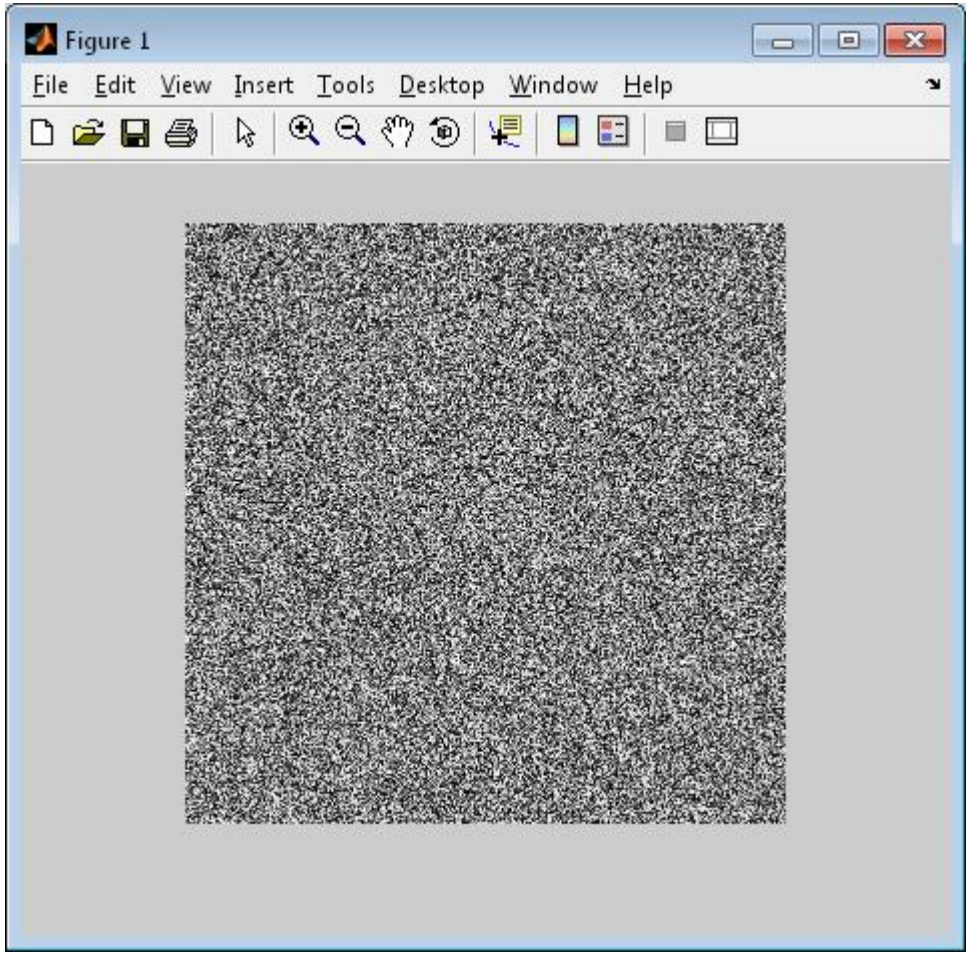


Hangok

```
fs = 44100; f0 = 200; % mintavételi frekvencia és
   alapfrekvencia
T = 2; % időtartam
n = [0:fs*T]; % időtengely (minta)
x = sin(2*pi*f0*n/fs); % a jel

plot(n/fs, x)
sound(x, fs)
```

Képek

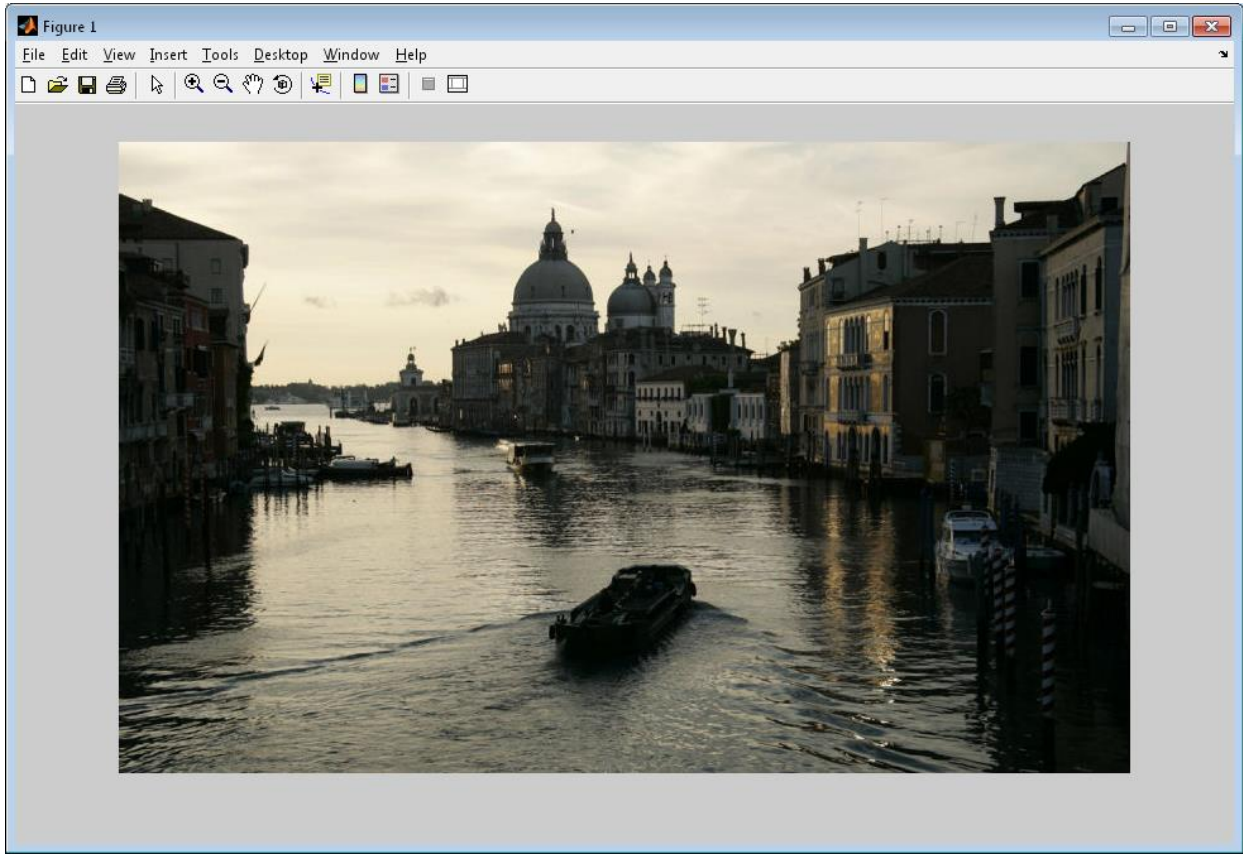
```
img=rand(300);
imshow(img)
```



Képek

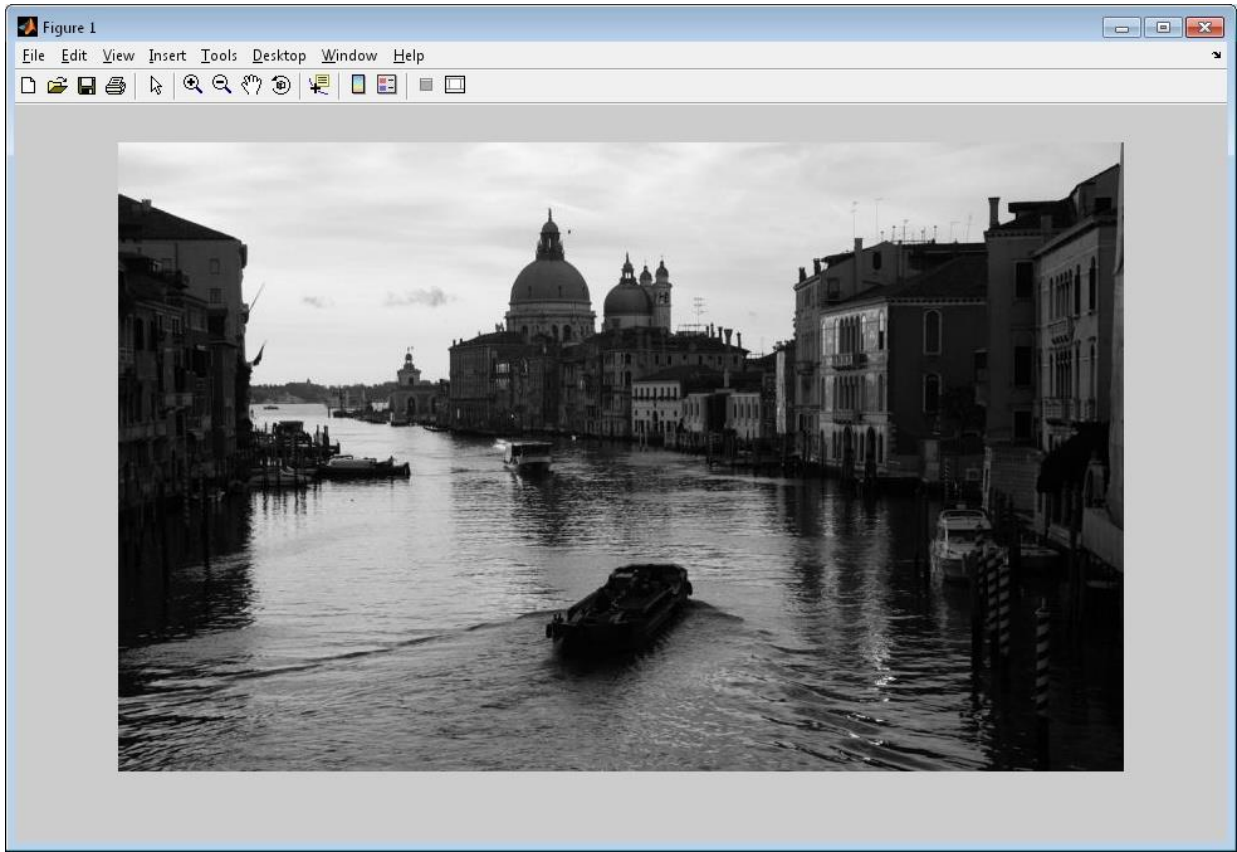
```
img=imread('img.jpg');
imshow(img)
size(img)
```

```
ans =

   500   800     3
```



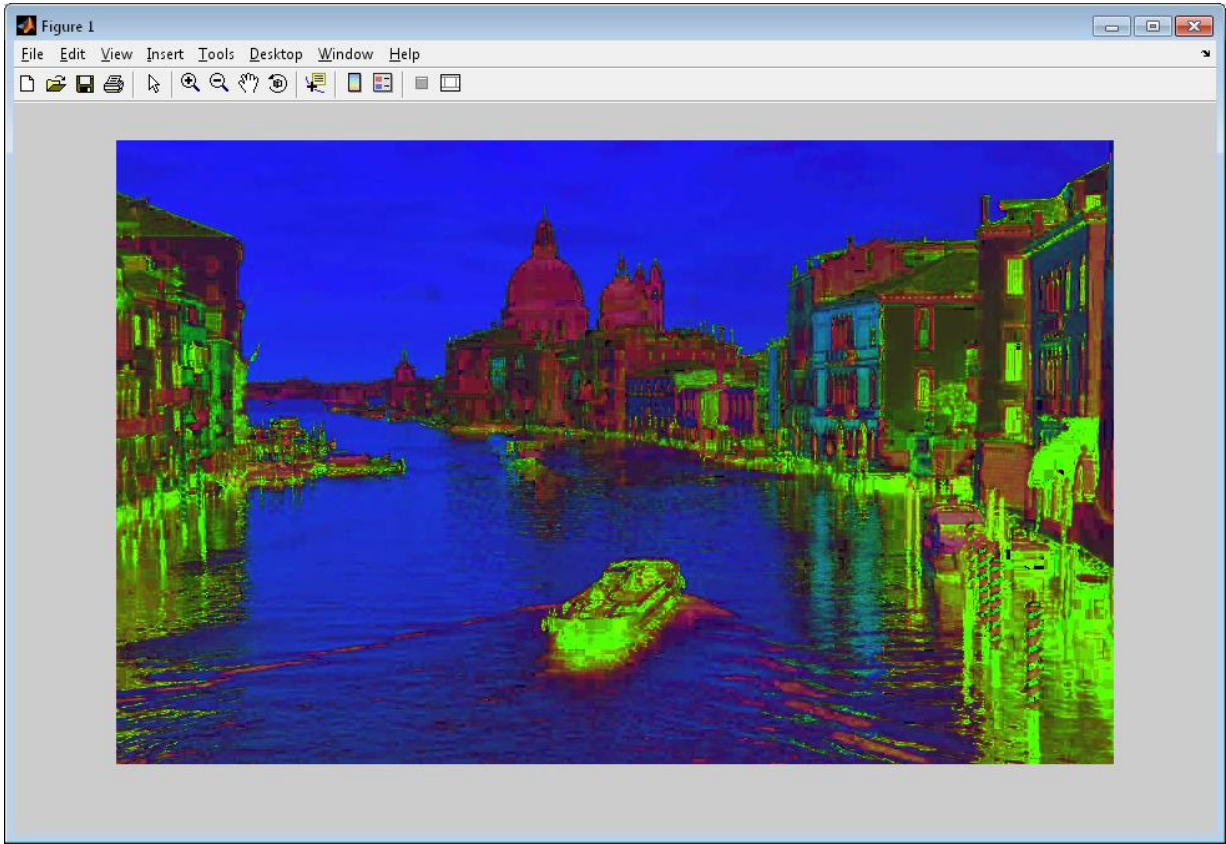
Képek

```
img2=rgb2gray(img);
imshow(img2)
```



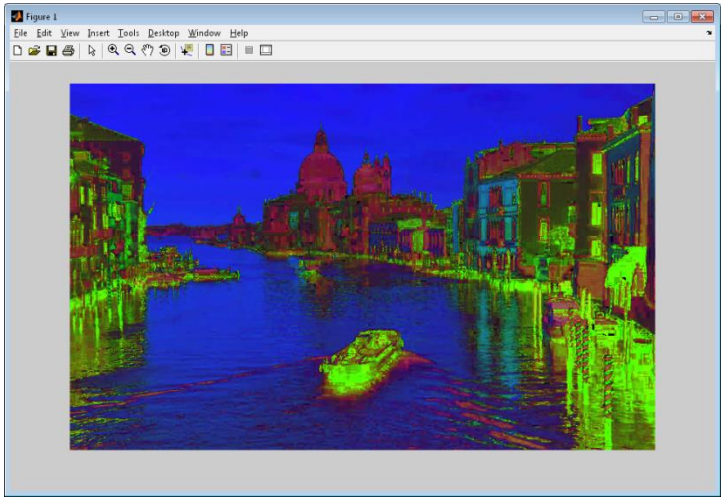
Képek

```
img2=rgb2hsv(img);
imshow(img2)
```

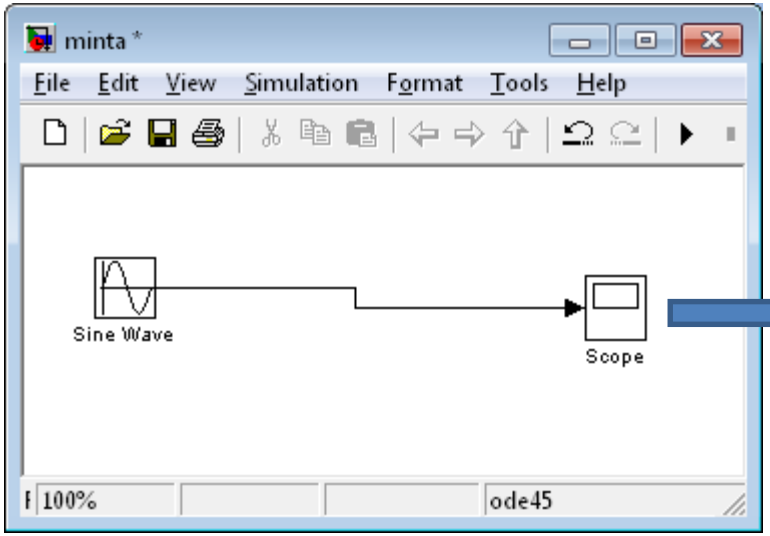


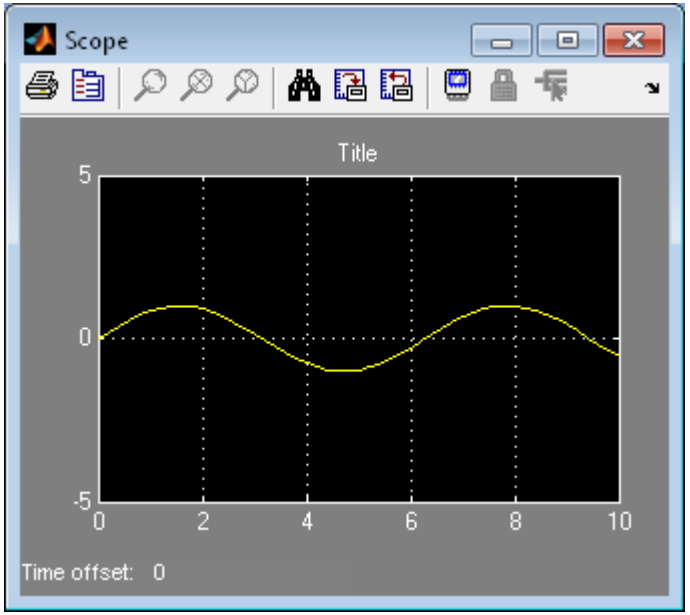
Képek

```
figure
subplot(3,1,1)
imshow(img2(:,:,1))
subplot(3,1,2)
imshow(img2(:,:,2))
subplot(3,1,3)
imshow(img2(:,:,3))
```



Simulink


minta *
File Edit View Simulation Format Tools Help
Sine Wave
Scope
100%
ode45


Scope
Title
5
0
-5
0 2 4 6 8 10
Time offset: 0

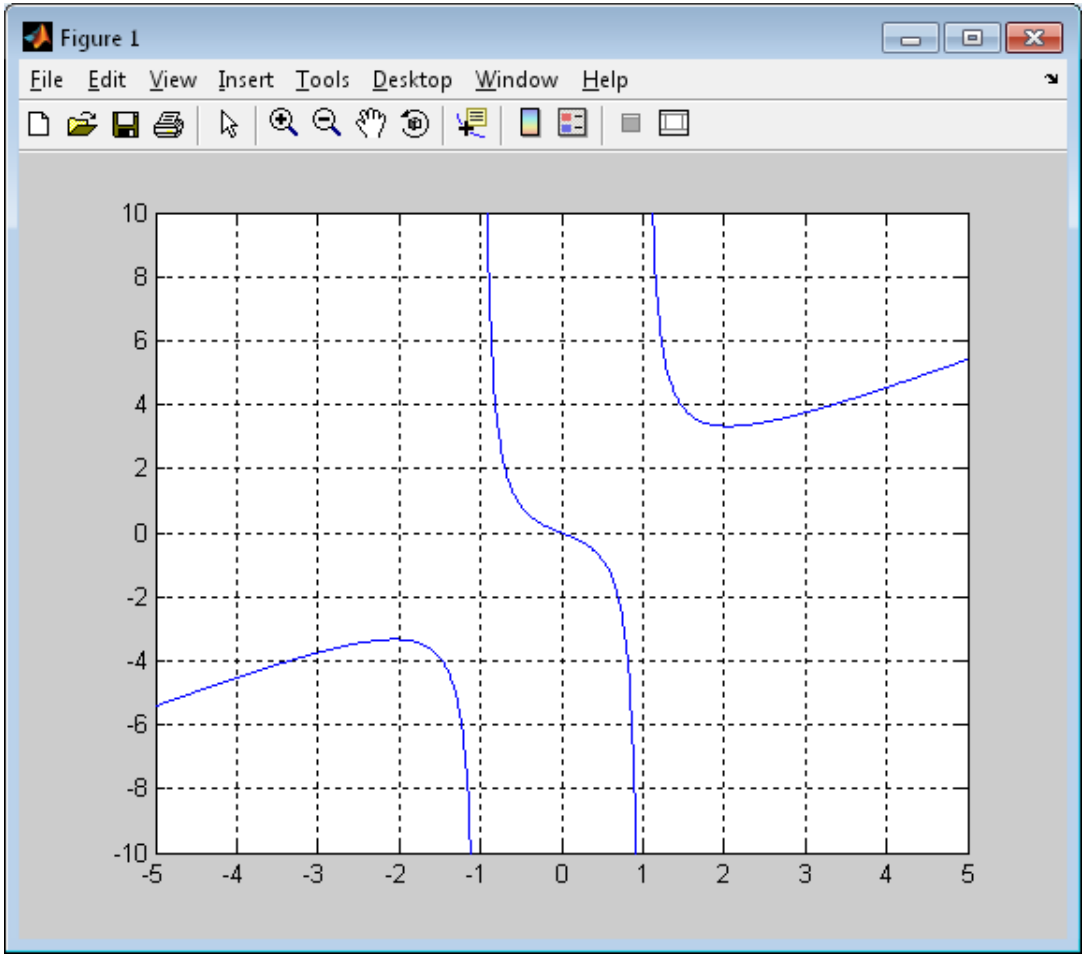
Függvény ábrázolás

- http://users.nik.uni-obuda.hu/kissdani
  - Függvényvizsgálat (bonyolultabb példákkal)

$$f(x) = x + \frac{2x}{x^2 - 1}$$

```
x=[-5:0.01:5]
y=x + (2*x./ (x.*x-1) )
plot(x,y)
Grid
xlim([-5 5])
ylim([-10 10])
```

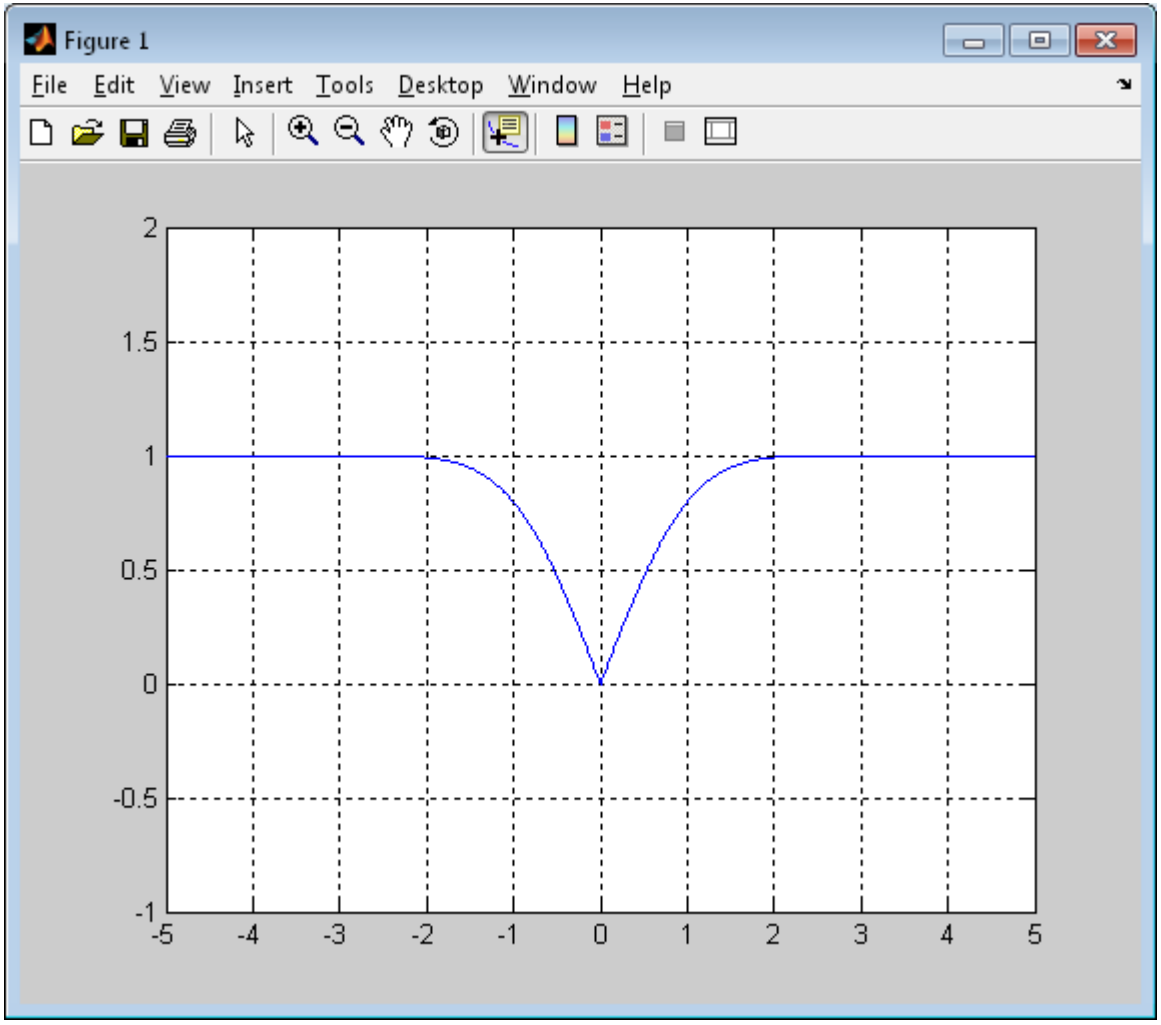
$$f(x) = x + \frac{2x}{x^2 - 1}$$



$$f(x) = \sqrt{1 - \mathrm{e}^{-x^2}}$$

```
x=[-5:0.01:5]
y=sqrt(1-exp(1).^(-x.^2))
plot(x,y)
Grid
xlim([-5 5])
ylim([-1 2])
```

$$f(x) = \sqrt{1 - \mathrm{e}^{-x^2}}$$



$$f(x) = \sin(\sin(x))$$

```
x=[-10:0.01:10]
y=sin(sin(x))
plot(x,y)
Grid
xlim([-6 6])
ylim([-1.1 1.1])
```

$$f(x) = \sin(\sin(x))$$

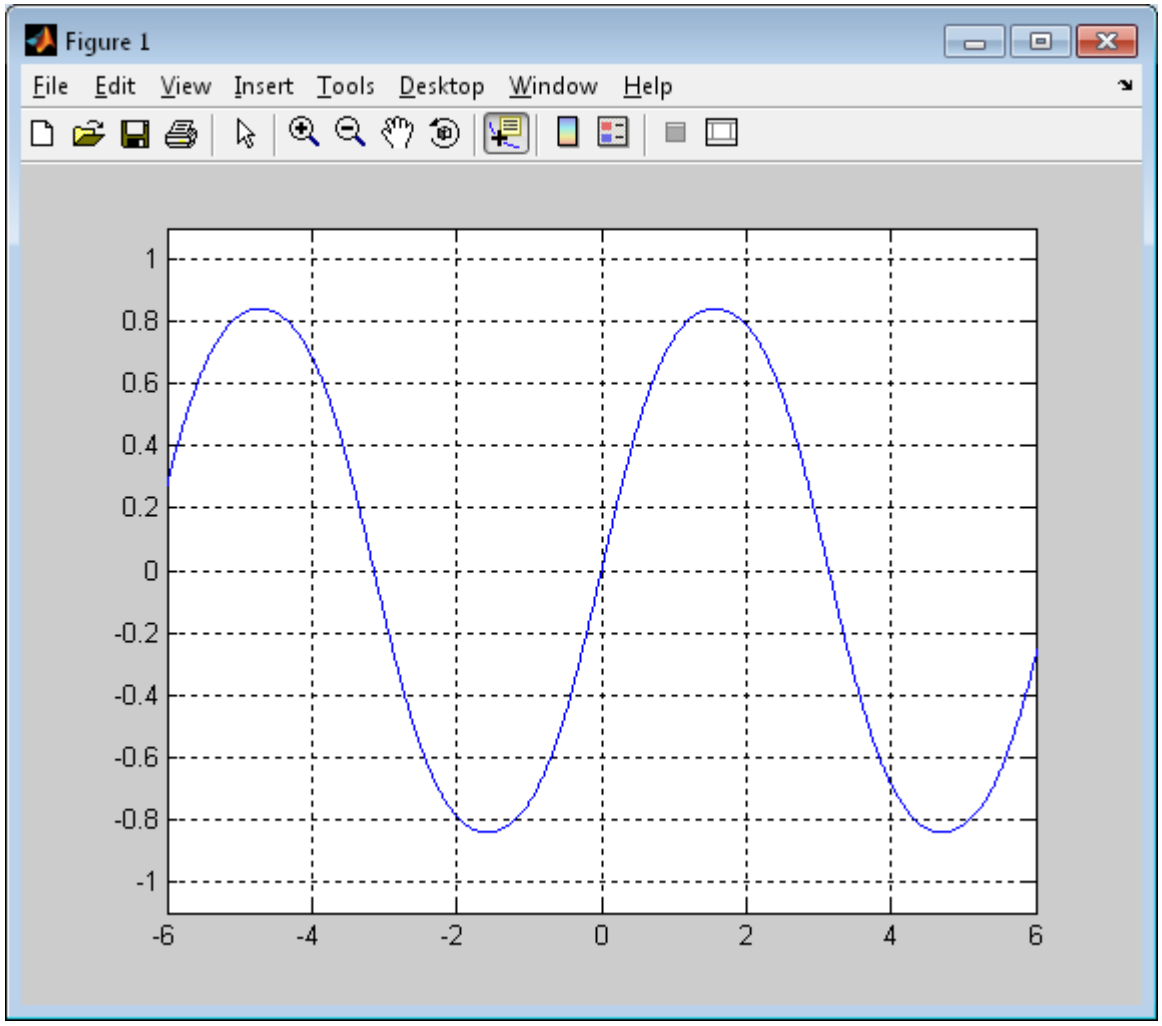


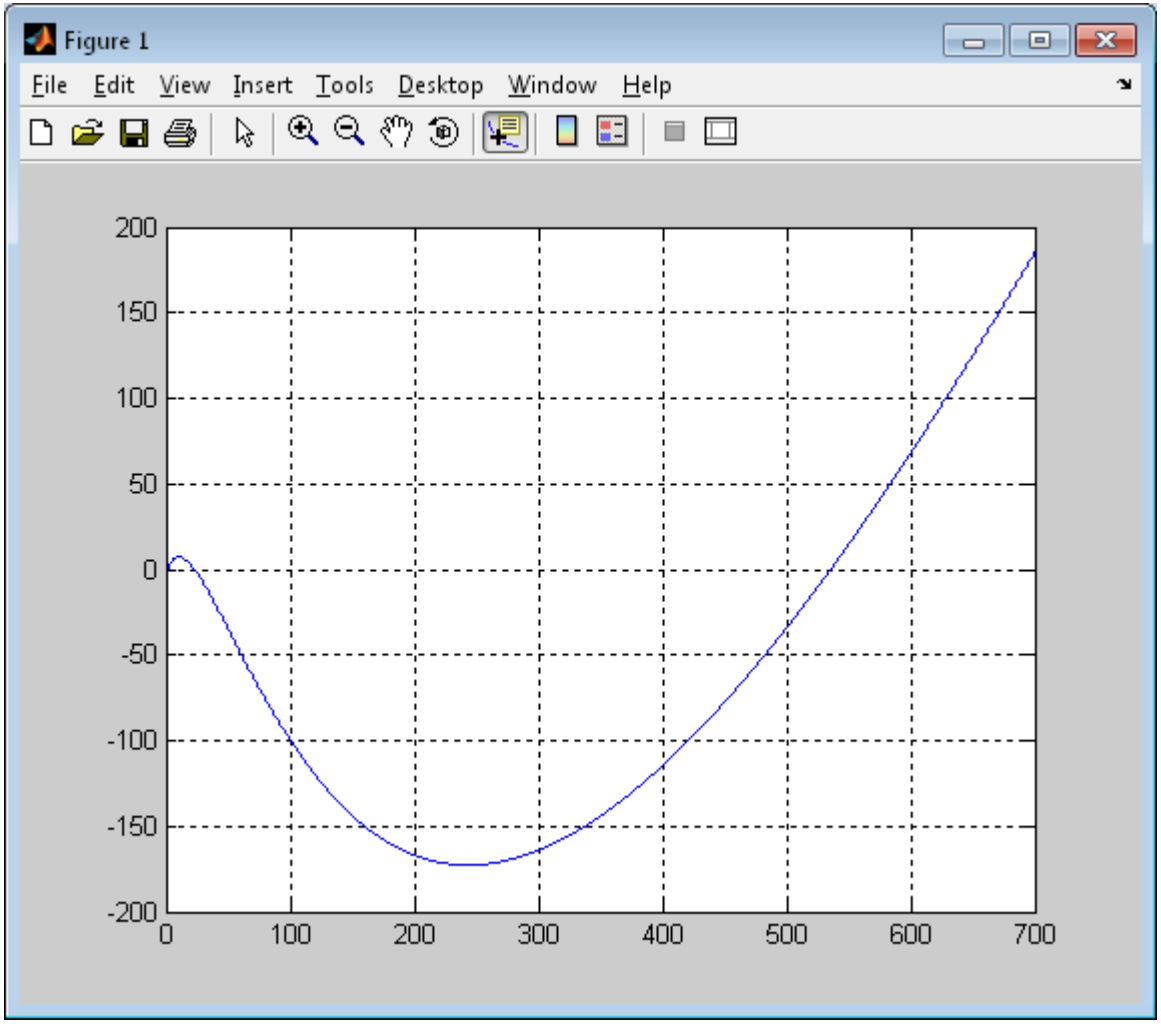
Figure 1
File Edit View Insert Tools Desktop Window Help
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-6
-4
-2
0
2
4
6

$$f(x) = x \cdot \sin(\ln(x))$$

```
x=[0:0.1:700]
y=x.*sin(log(x));
plot(x,y)
grid
```

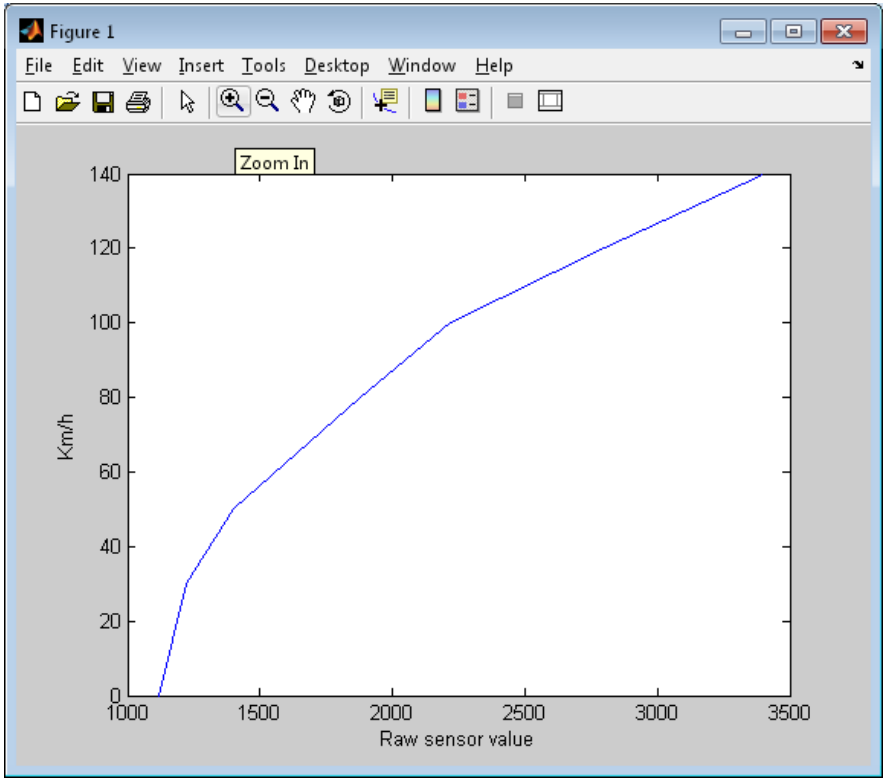
Log(x) => ln x
Log2(x) =>$\log_2 x$
Log10(x) =>$\log_{10} x$

$$f(x) = x \cdot \sin(\ln(x))$$



Közelítő függvények alkalmazása

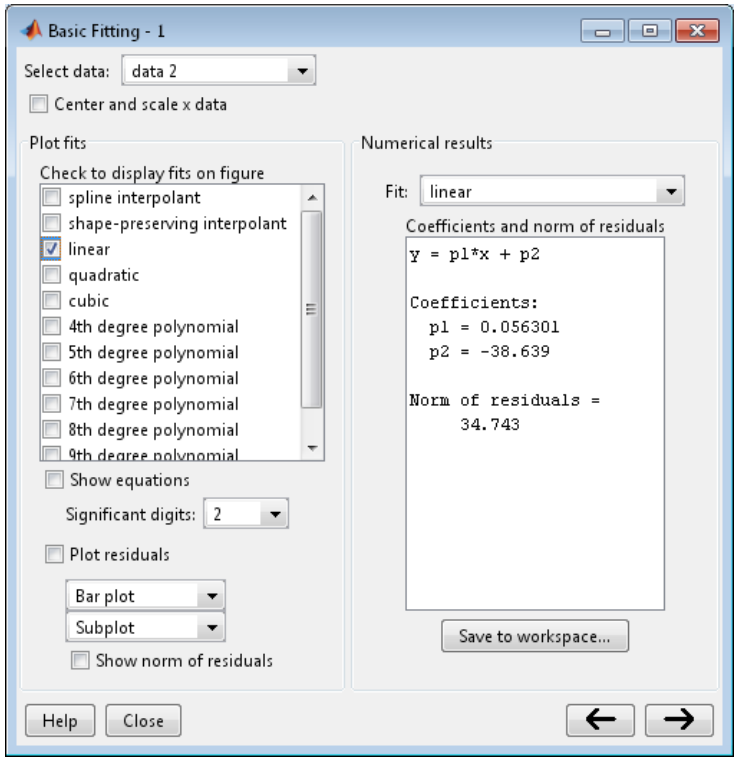
```
airspeed=[
0   1120    ;
30  1220    ;
50  1400    ;
80  1880    ;
100 2220    ;
120 2800    ;
140 3400    ;
]
```

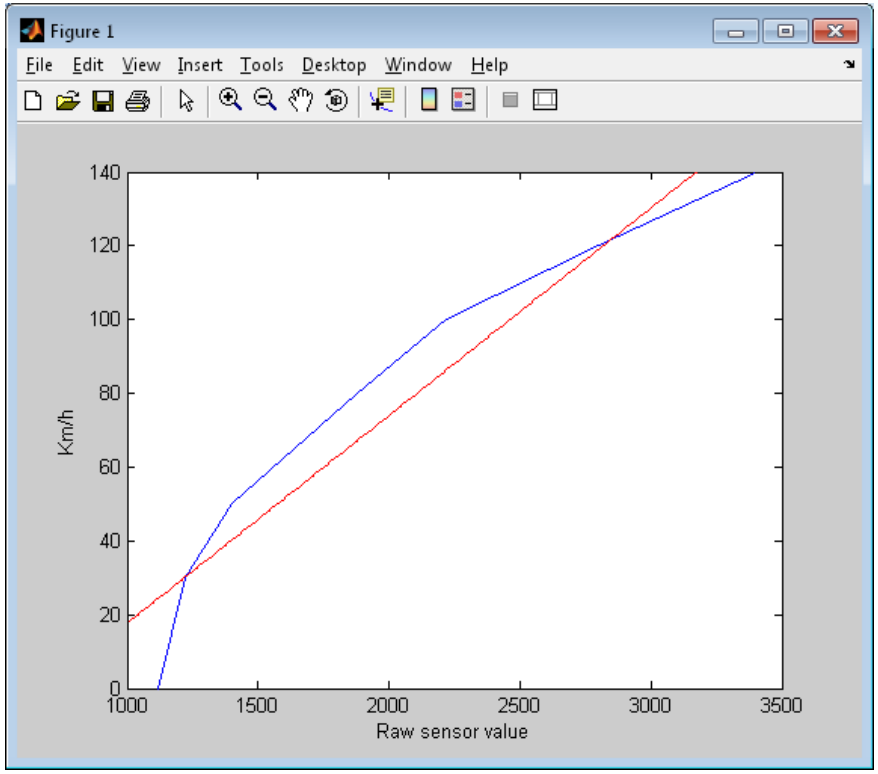



```
plot(airspeed(:,2), airspeed(:,1))
ylabel('Km/h')
xlabel('Raw sensor value')
```

Közelítő függvények alkalmazása

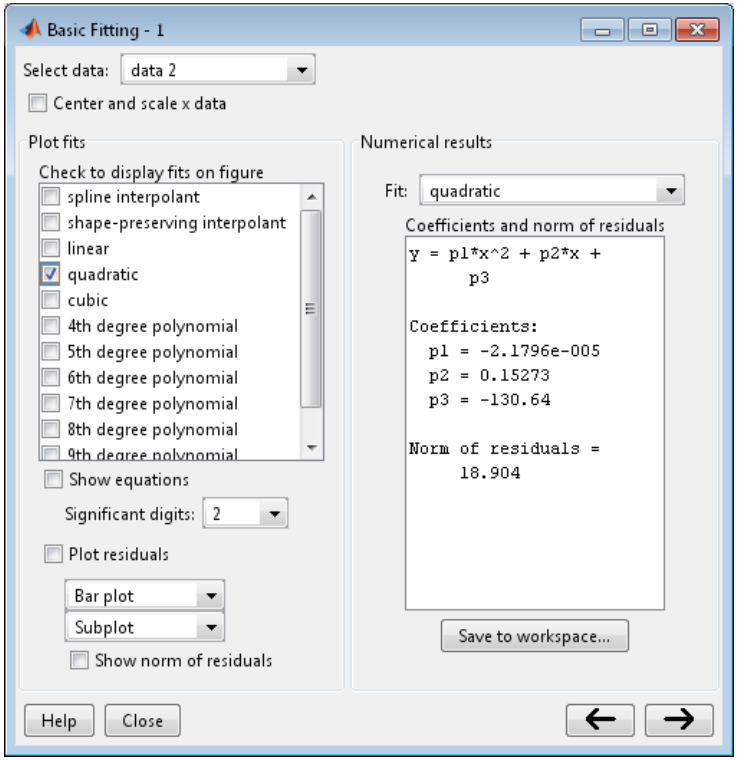
Plot -> Tools -> **Basic fitting**

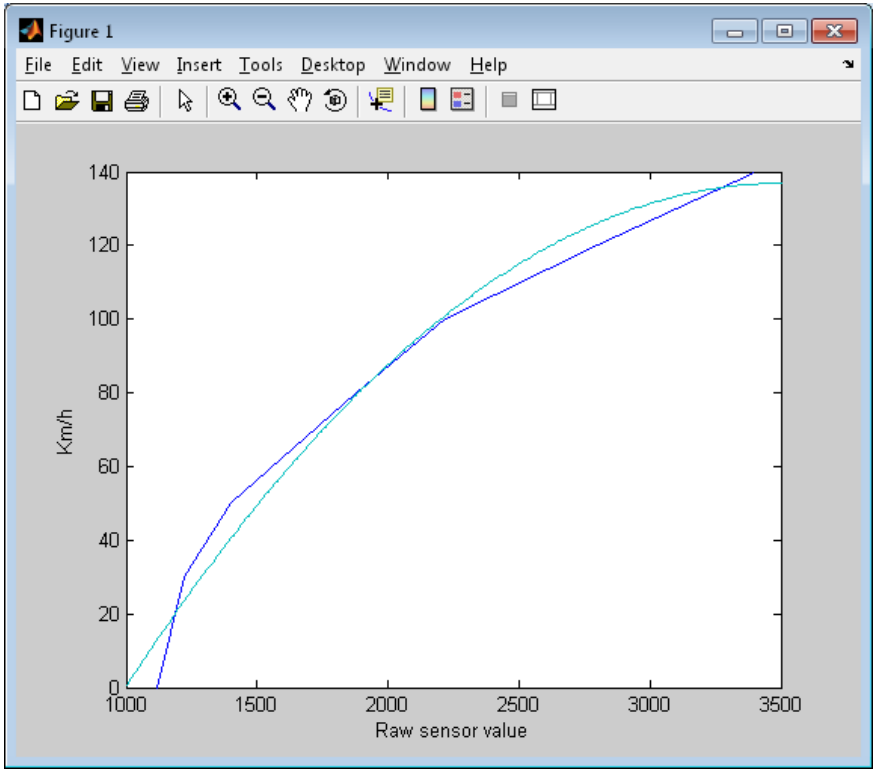




Közelítő függvények alkalmazása

Plot -> Tools -> **Basic fitting**

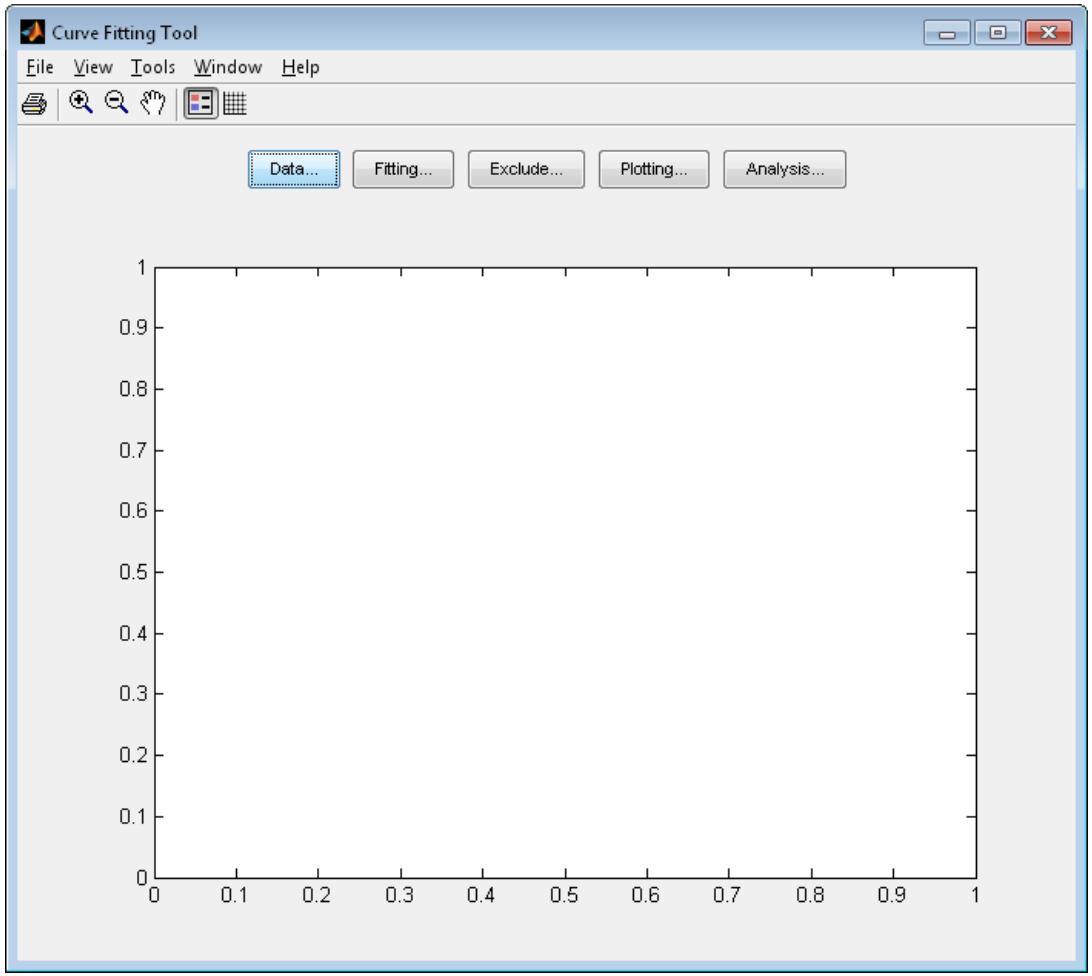




Közelítő függvények alkalmazása

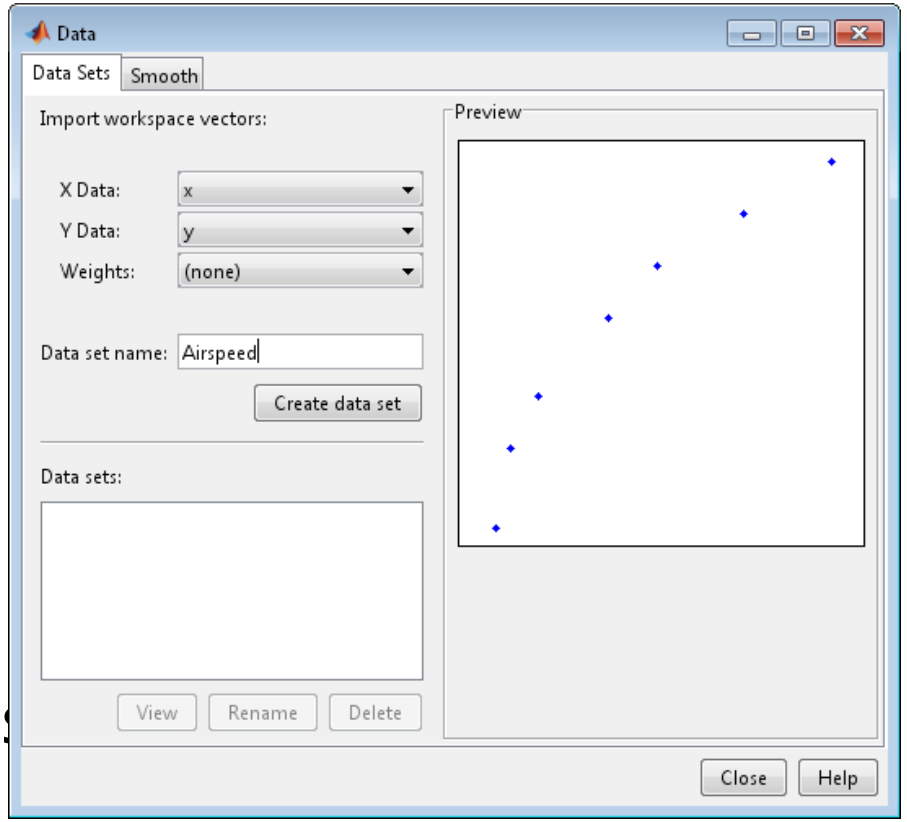
- **Curve Fitting Tool**

```
>> cftool
```



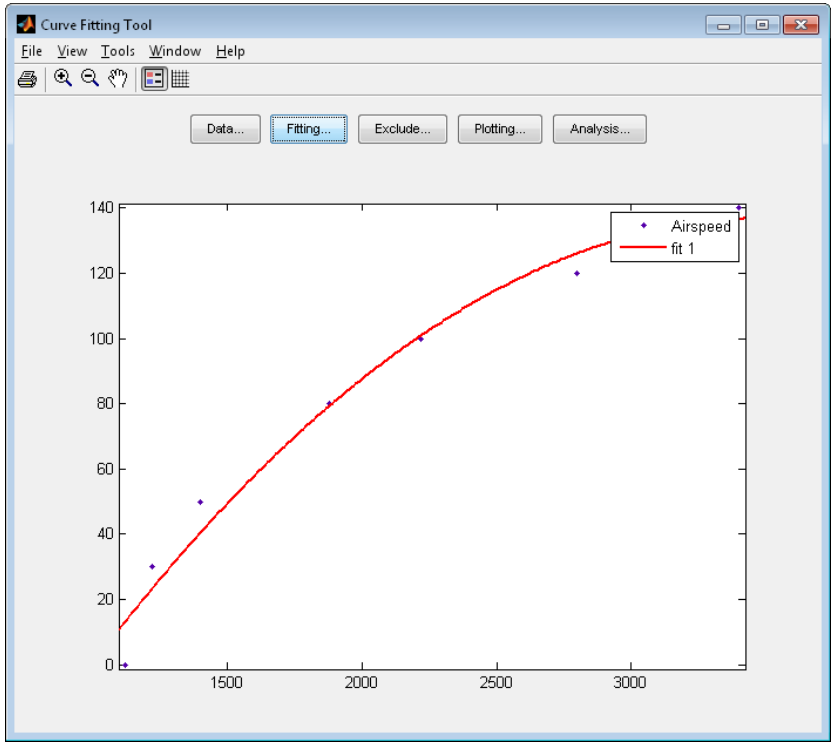
Közelítő függvények alkalmazása

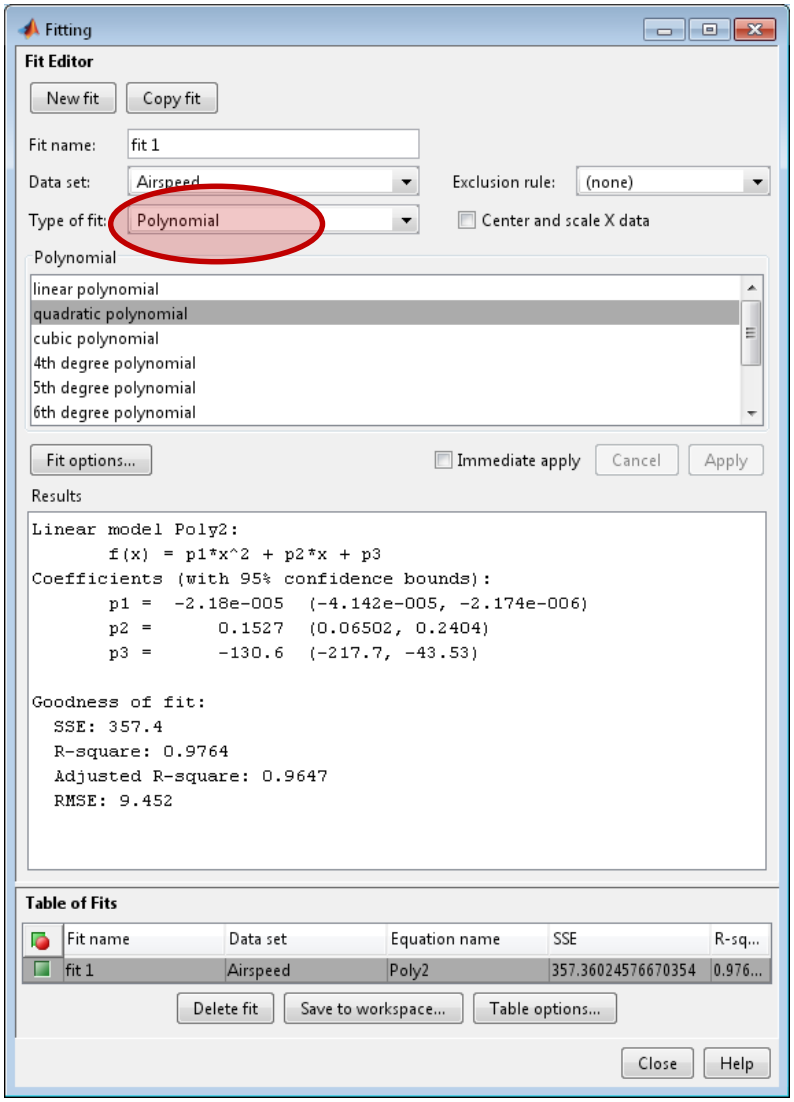
```
x=airspeed(:,2)
y=airspeed(:,1)
cftool


….
X Data: x
Y Data: y
Data set name: Airs
-> Create data set
```



Közelítő függvények alkalmazása

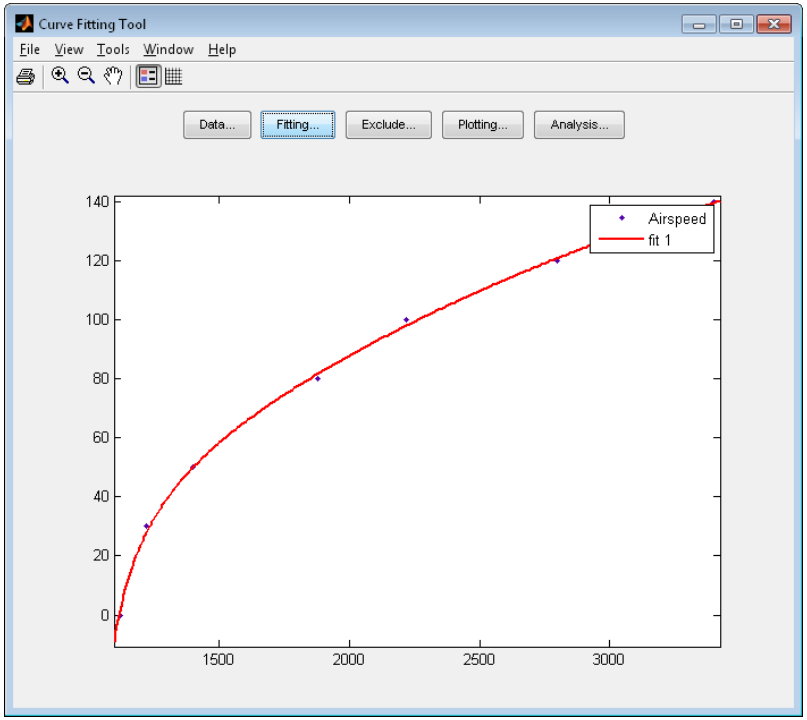
Fitting

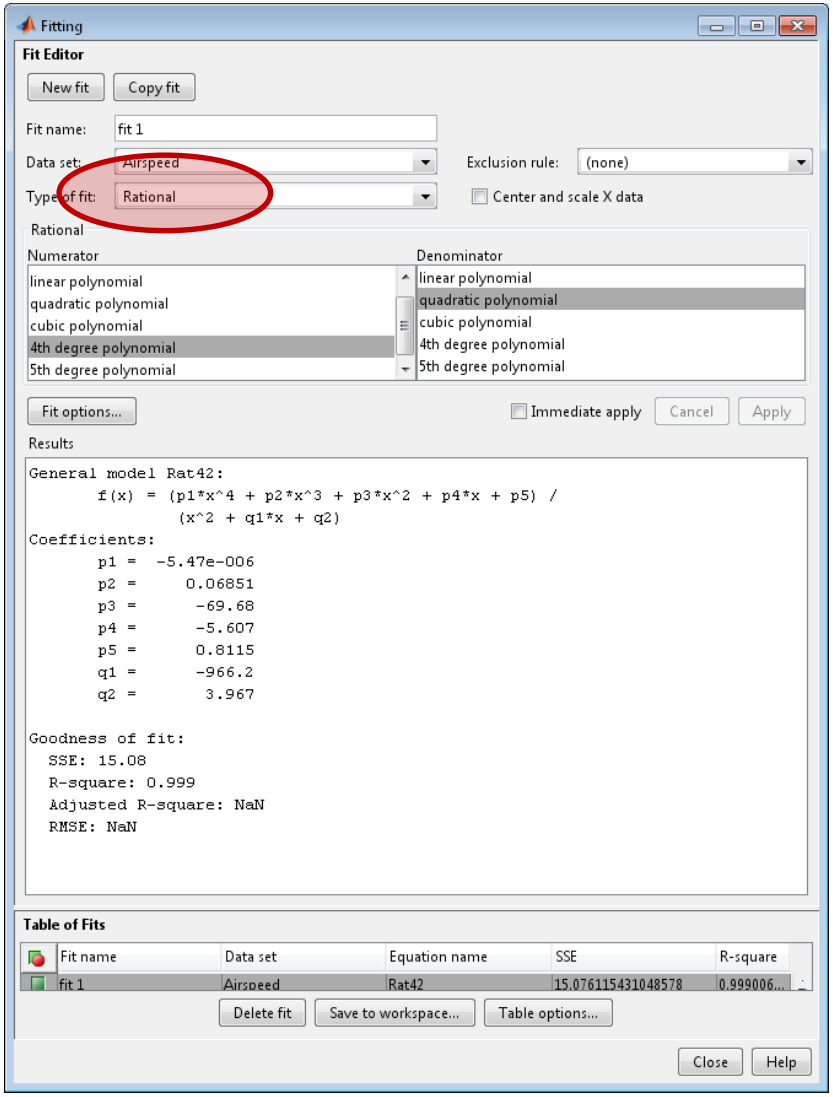




Közelítő függvények alkalmazása

Fitting





Jelek szűrése

- Átlagolás
- Medián szűrés
- Csúszó ablakos szűrés
- Stb…

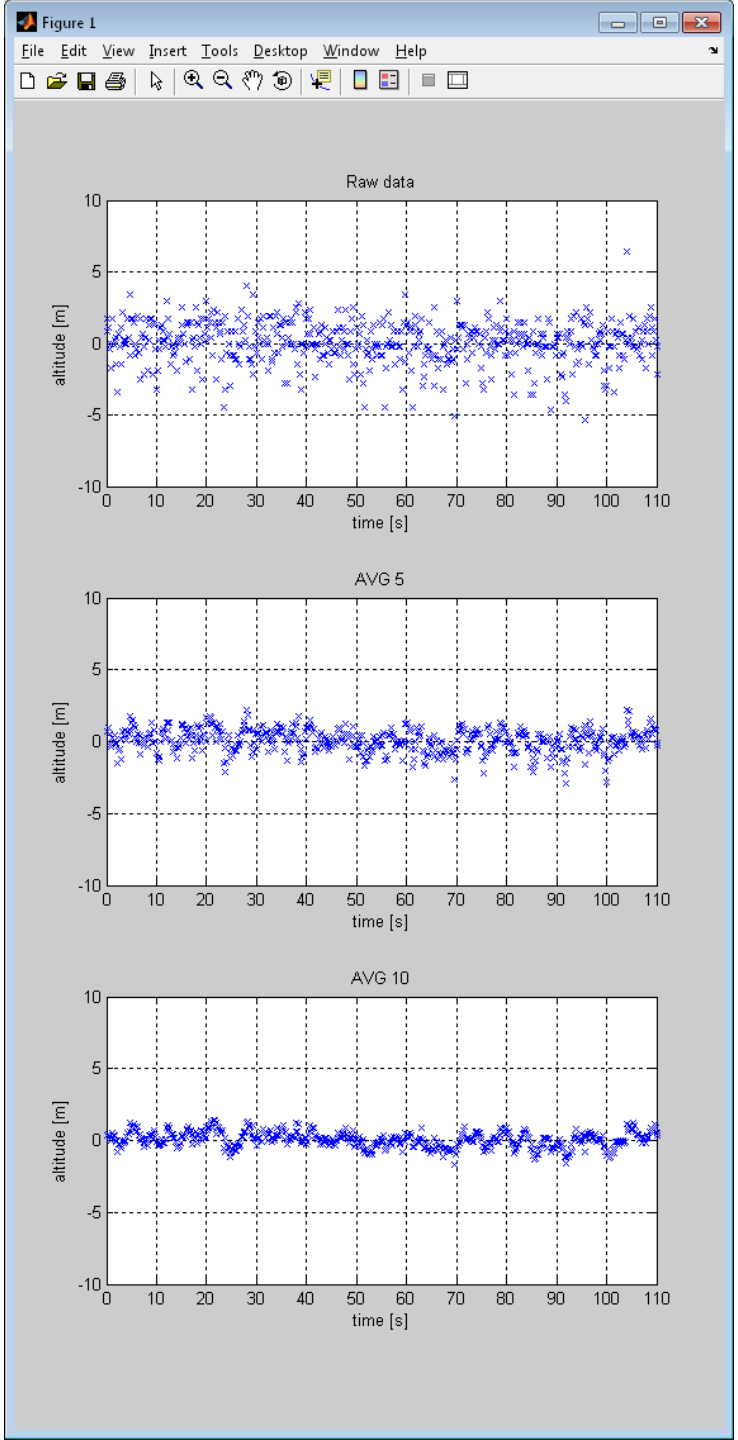


Figure 1
File Edit View Insert Tools Desktop Window Help
Raw data
altitude [m]
time [s]
AVG 5
altitude [m]
time [s]
AVG 10
altitude [m]
time [s]

Számábrázolási hibák

- Lebegő pontos vs. Fix pontos

```
x = [-5:0.001:5];
y=sin(x)*5;
subplot(2,1,1);
plot(x,y);
Grid;
ylim([-6, 6]);
subplot(2,1,2);
plot(x,int32(y));
Grid;
ylim([-6, 6]);
```