

Basic: graphics, plotting

Matlab basics: Graphics, plotting

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Basic 2d-graphics, plot

- *"Matlab has excellent support for data visualization and graphics with over 70 types of plots currently available. We won't be able to go into all of them here, nor will we need to, as they all operate in very similar ways. In fact, by understanding how Matlab plotting works in general, we'll be able to **see most plot types as simple variations of each other**. Fundamentally, they all **use the same basic constructs**."*
- Links:
 - <https://se.mathworks.com/help/matlab/ref/plot.html>
 - <http://ubcmatlabguide.github.io/html/plotting.html>

Basic 2d-graphics

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- If x is a 1-by- N (or N -by-1) vector, and y is a 1-by- N (or N -by-1) vector, then

```
>> plot(x,y)
```

creates a figure window, and plots the data points with joining line segments in the axes. The points are:

$(x(1), y(1)), (x(2), y(2)), \dots, (x(N), y(N))$

- The axes are automatically chosen so that all data just fits into the figure window. This can be changed by the `axis`, `xlim`, `ylim`-commands.

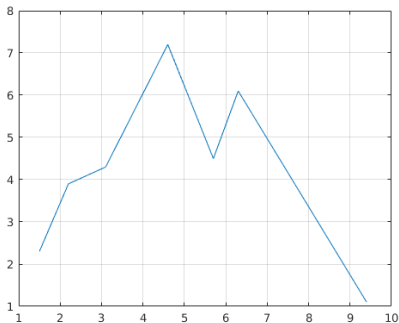
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Function *plot* can be used for simple "join-the-dots" xy-plots.

```
>> x=[1.5 2.2 3.1 4.6 5.7 6.3 9.4];  
>> y=[2.3 3.9 4.3 7.2 4.5 6.1 1.1];  
>> plot(x,y);grid on
```



Basic 2d-graphics, general form

Continue keeping the previous plot:

```
>> hold on           % Keep the previous lines.  
>> plot(x,y,'or')   % Mark datapoints with ...  
    'o'-marker, r='red'  
>> shg              % show graphics
```

- General form:

```
plot(x1,y1,'string1',x2,y2,'string2', ...)
```

The 'string'-parts may be missing.

- `plot(x,y,'r*--')`

Use red *-markers, join with red dashed line segments.

help plot -> table of markers

Various line types, plot symbols and colors: `plot(X,Y,S)`

S is a character string made from one element from any or all of the following 3 columns:

| | | | | | |
|---|---------|-----|---------------------|--------|---------|
| b | blue | . | point | - | solid |
| g | green | o | circle | : | dotted |
| r | red | x | x-mark | -. | dashdot |
| c | cyan | + | plus | -- | dashed |
| m | magenta | * | star | (none) | no line |
| y | yellow | s | square | | |
| k | black | d | diamond | | |
| w | white | v | triangle (down) | | |
| | | ^ | triangle (up) | | |
| | | < | triangle (left) | | |
| | | > | triangle (right) | | |
| | | p,h | pentagram, hexagram | | |

Plotting graphs of functions

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Just take enough points to get smoothness.

```
>> x=linspace(0,3*pi); % Default: 100 points
>> y=sqrt(x).*sin(x); % Note again: (.* )
>> plot(x,y)
>> figure % Open a new graphics window.
>> x1=linspace(0,pi,1000); % More points.
>> y1=cos(4*x1).*sin(x1);
>> m=mean(y1);
>> plot(x1,y1,[0 pi],[m m],'r--') % "red" dashed
>> legend('Function','mean'); grid on
```

References in Finnish:

<http://math.aalto.fi/~apiola/matlab/opas/mini/vektgraf.html>

<http://math.aalto.fi/~apiola/matlab/opas/lyhyt/grafiikka.html>

First problems on plotting, please **work for a while!**

- 1** Plot $y = 2 \sin(3t + 2)^3 \sqrt{5t + 1}$ over the interval $[0, 5]$.
Put a title and label the axes. (Let t be time and y speed.)
Try some more commands, like `grid on`, etc.
- 2** Plot $y = xe^{-x} \cos x$ and $z = \frac{\sin x}{x}$ on the interval $[0, 2\pi + 1]$.
Use `grid on` and `legend`
Check what the “value of the vector” z is when $x = 0$.
Remember: z is not a function; it is just a vector of function values!
(At least if you don't define it as a function, but let's not do it here.)

More graphics (partly later ?)

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TO BE COMPLETED ..

- Parametric plot, circle, polygon (HERE) Epicycloids
HIG-Hig p. 93
- ./meshscript.m
- EDIT LINKS -> [wwwaalto](http://wwwaalto.fi)
<file:///home/heikki/Dropbox/Public/matlab/opus/2015/graph>
Plotting auxcommands: ginput, grid, gtext, title, xlabel,
ylabel (WJPalm 1-19, Page 25)