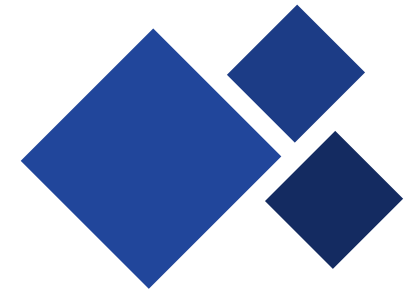# Lecture 9

Introduction to MatLab

Tomaso Erseghe

9.2 Plots in MatLab

An introduction

- ✦ Defining time and signal samples

- ✦ Drawing a figure

- ✦ Controlling the figure layout

- ✦ Multiple plots
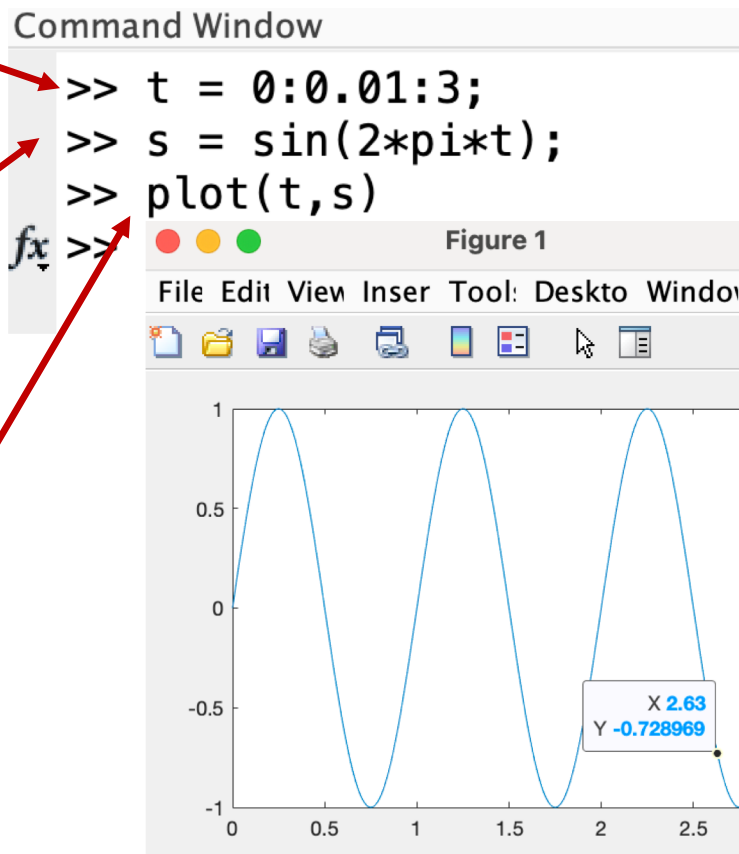
Plotting a signal

A starting example

Define time samples
from 0 to 3 spaced by .01

Define signal samples
using the MatLab function sin, here pi is 3.14…

Plot

Command Window

```
>> t = 0:0.01:3;
>> s = sin(2*pi*t);
>> plot(t,s)
fx >>
```

Figure 1

File Edit View Inser Tool: Deskto Window

X 2.63
Y -0.728969

Plotting a signal

Using a script

Run script

Open a script

must be a .m file, with no spaces or special characters in the name
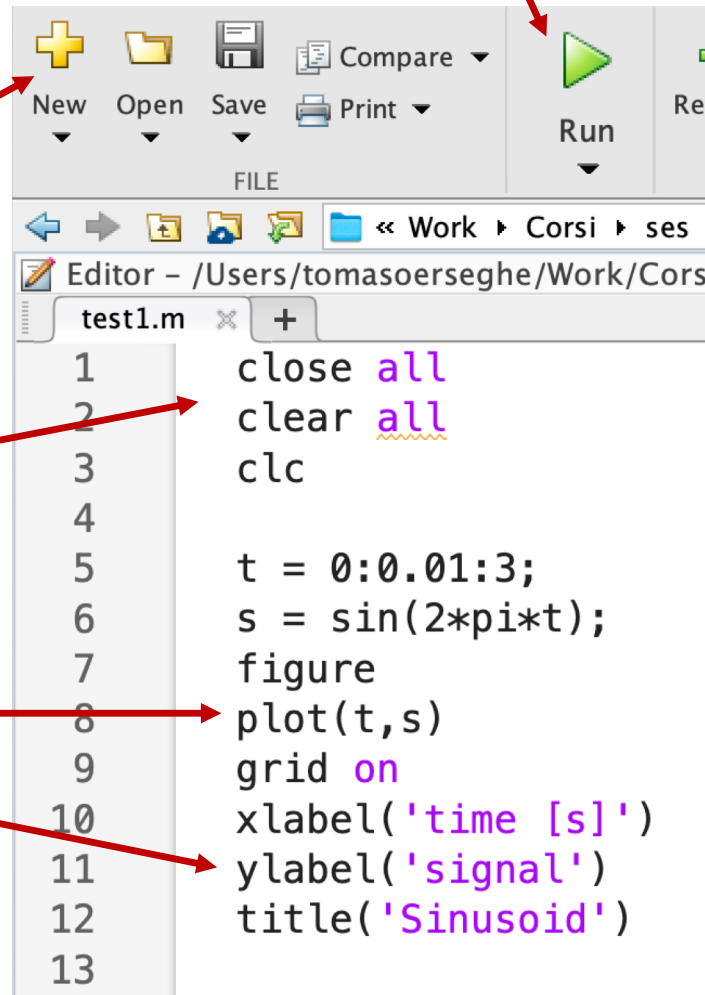
Clear memory

Close figures, clear variables and command window

Plot

Add grid, labels, and title

New Open Save Print Compare Run Ref

FILE

« Work ▸ Corsi ▸ ses

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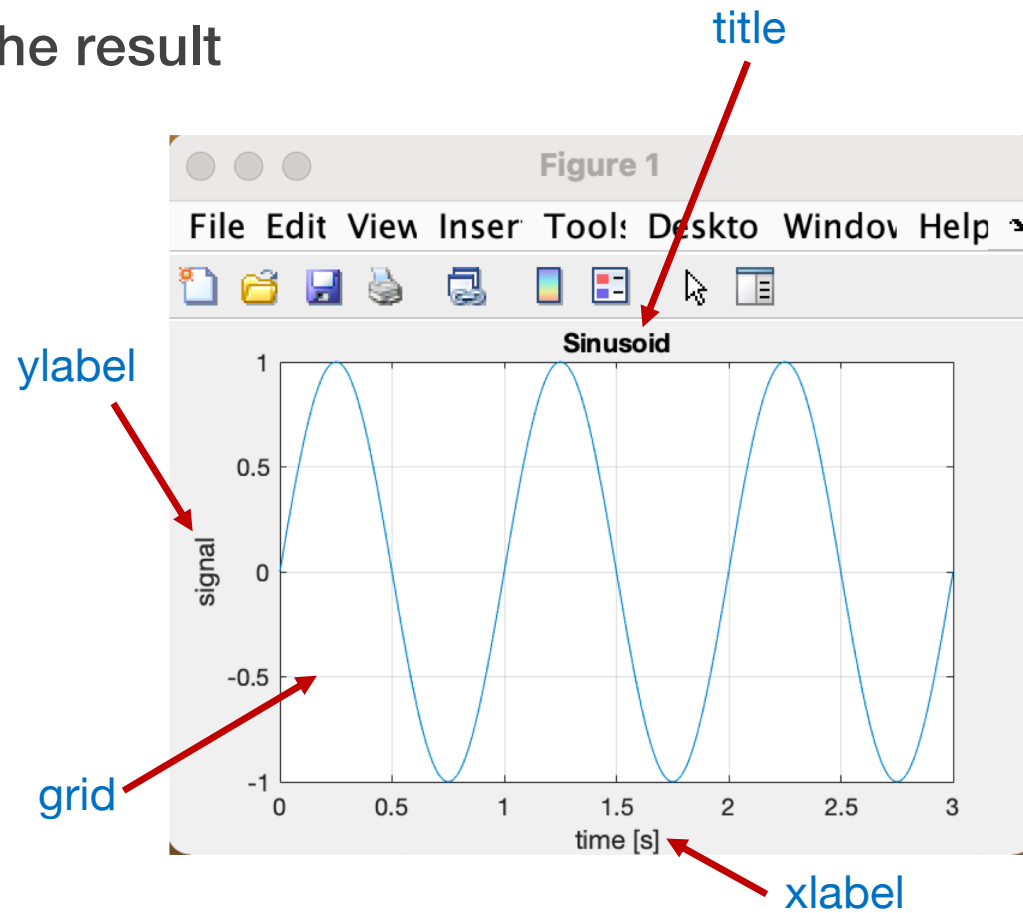
test1.m

```
1   close all
2   clear all
3   clc
4
5   t = 0:0.01:3;
6   s = sin(2*pi*t);
7   figure
8   plot(t,s)
9   grid on
10  xlabel('time [s]')
11  ylabel('signal')
12  title('Sinusoid')
13
```
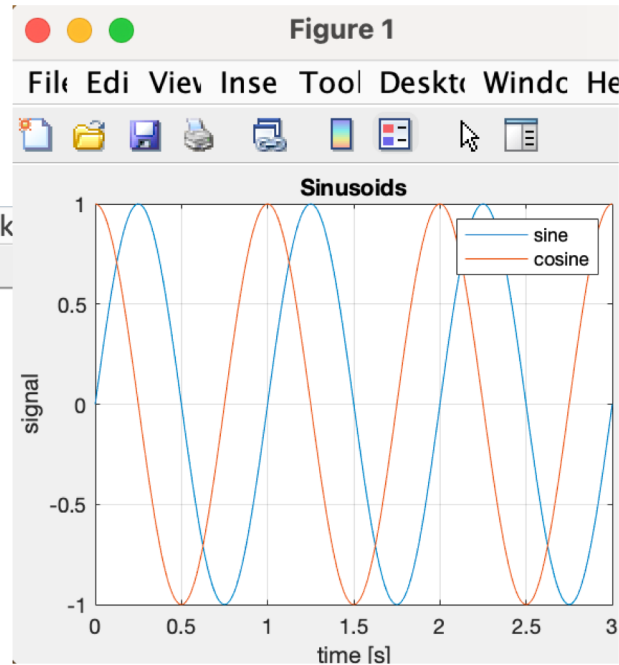
Plotting a signal

The result

Multiple plots

Same window

```matlab
close all
clear all
clc

t = 0:0.01:3;
s = sin(2*pi*t);
c = cos(2*pi*t);
figure
plot(t,s,t,c)
grid on
xlabel('time [s]')
ylabel('signal')
title('Sinusoids')
legend('sine', 'cosine')
```

Put one after another

Add legend

Multiple plots

Same window – an alternative

Plot the first

Hold the result, otherwise only the last plot command will appear

Plot the second

```matlab
close all
clear all
clc

t = 0:0.01:3;
s = sin(2*pi*t);
c = cos(2*pi*t);
figure
plot(t,s)
hold on
plot(t,c)
hold off
grid on
xlabel('time [s]')
ylabel('signal')
title('Sinusoids')
legend('sine', 'cosine')
```
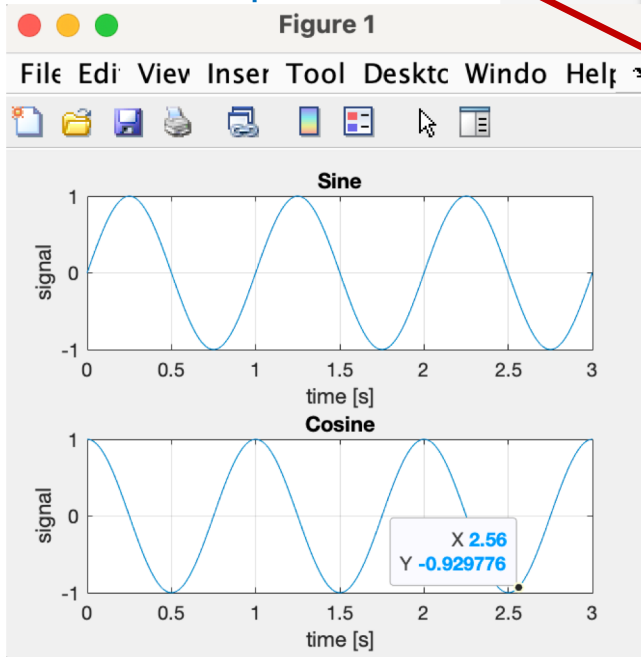
Multiple plots

Multiple windows

subplot(rows,cols,pos)

On a grid of size rows x cols positions the plot at pos

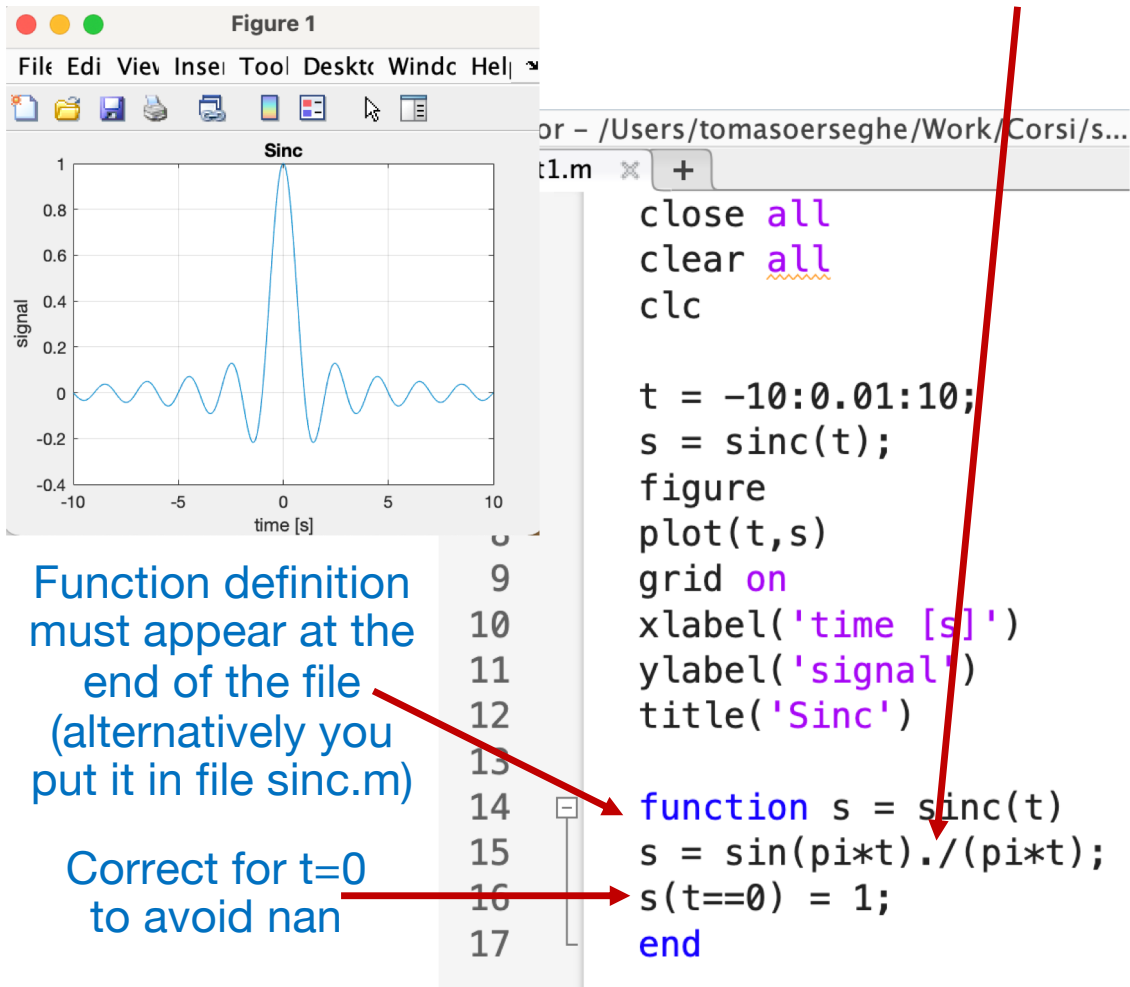Editor – /Users/tomasoerseghe/Work/Cors

test1.m

```
1   close all
2   clear all
3   clc
4
5   t = 0:0.01:3;
6   s = sin(2*pi*t);
7   c = cos(2*pi*t);
    figure
    subplot(2,1,1)
    plot(t,s)
    grid on
    xlabel('time [s]')
    ylabel('signal')
    title('Sine')
    subplot(2,1,2)
    plot(t,c)
    grid on
    xlabel('time [s]')
    ylabel('signal')
    title('Cosine')
```

Defining a function

entrywise division is needed here!

Function definition must appear at the end of the file (alternatively you put it in file sinc.m)

Correct for t=0 to avoid nan

```matlab
close all
clear all
clc

t = -10:0.01:10;
s = sinc(t);
figure
plot(t,s)
grid on
xlabel('time [s]')
ylabel('signal')
title('Sinc')

function s = sinc(t)
s = sin(pi*t)./(pi*t);
s(t==0) = 1;
end
```

Choosing the sampling rate

Your sampling spacing must be sufficiently small to capture the function shape!

```matlab
close all
clear all
clc

t = -10:1:10;
s = sinc(t);
figure
plot(t,s)
grid on
xlabel('time [s]')
ylabel('signal')
title('Sinc')

function s = sinc(t)
s = sin(pi*t)./(pi*t);
s(t==0) = 1;
end
```

Discrete-time signals

use stem
instead of plot

```
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test1.m    +

1   close all
2   clear all
3   clc
4
5   t = -10:.25:10;
6   s = sinc(t);
7   figure
    stem(t,s)
    grid on
    xlabel('time [s]')
    ylabel('signal')
    title('Sinc')

    function s = sinc(t)
    s = sin(pi*t)./(pi*t);
    s(t==0) = 1;
    end
```
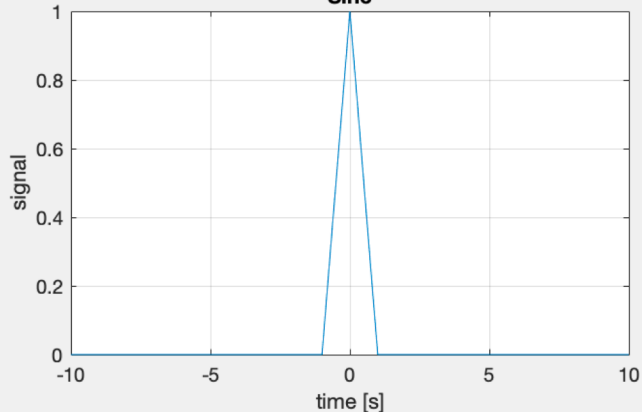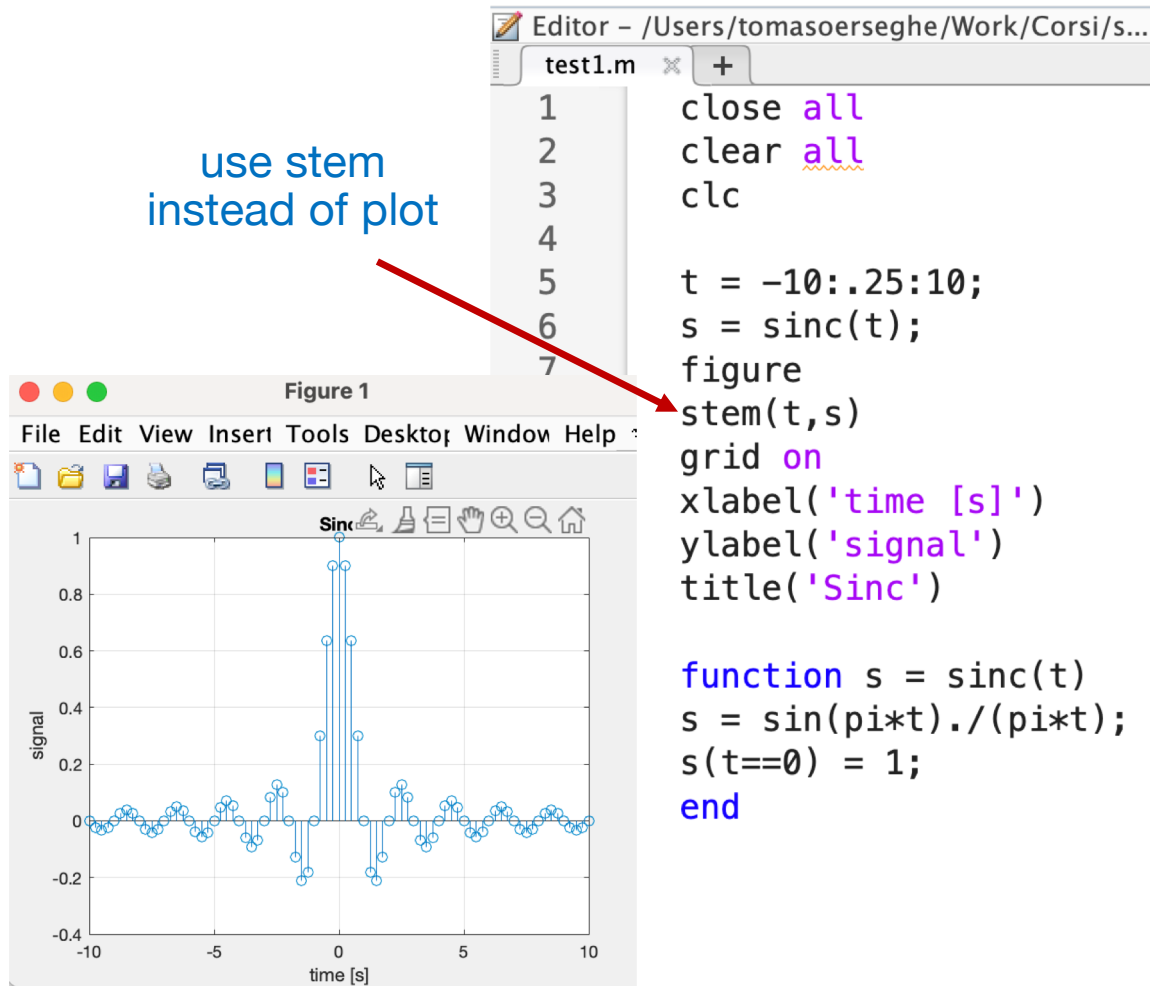
Exercises

On MatLab plots

Signal plots is a fundamental step that allows you to correctly represent your data.

Practice yourself with plots, multiple plots, and the representation of **complex signals** through their real and imaginary parts, or through absolute value and phase.

Pay particular attention in correctly defining the **sampling rate/spacing** when representing continuous-time signals