

MA1710: Key points in week 4 Matlab session

Using figure and plot

To plot $\sin(\pi x)$, $-2 < x < 2$ can be done as given below.

```
x=linspace(-2, 2);
```

```
y=sin(pi*x);
```

```
figure(10)
```

```
plot(x, y);
```

The plot appears in a figure with the label 10.

The same scale for both axis

To plot the unit circle can be done with the following statements.

```
t=linspace(-pi, pi, 400);
```

```
x=cos(t);
```

```
y=sin(t);
```

```
figure(14)
```

```
plot(x, y);
```

```
axis equal
```

You need the x and y axis to be scaled in the same way.

Multiple curves and the line type

You can plot several curves with one `plot` command and you can choose the line type for each. The following is an example.

```
x=linspace(-pi, pi, 400);  
y1=cos(x)+2*sin(x);  
y2=sqrt(5)*cos(x);  
  
figure(15)  
plot(x, y1, x, y2, '--');
```

Line thickness, labelling etc.

You can adjust most properties of your figures.

```
%...
plot(x1, y1, x2, y2, x3, x3, '--', 'LineWidth', 3)
axis equal

%% use 14pt for the numbers on the axis
set(gca, 'FontSize', 14);

%% add other things at 16pt
xlabel('x-axis', 'FontSize', 16)
ylabel('y-axis', 'FontSize', 16)
%...
```

You probably need to look up the statements that you do not use frequently.

Using hold on and hold off

You can have multiple plot commands so that you 'add' to a figure and you can adjust each bit separately. hold off and hold off surrounding the statements is the mechanism for this.

```
%...
figure(18)
clf
hold on

plot(x1, y1, 'LineWidth', 3)
plot(x2, y2, '-.', 'LineWidth', 2)
plot(x3, x3, '--');
leg=legend('y=x^3', 'y=x^{1/3}', 'y=x',...
          'Location', 'Best');
set(leg, 'FontSize', 14);

% ...
hold off
```

Using print and creating a PDF

To create a PDF of each figure can be done as indicated in the following example.

```
print('x_cubed_and_inverse.eps', '-depsc')
system('epstopdf x_cubed_and_inverse.eps');
```

The `print` statement creates `x_cubed_and_inverse.eps`.

The `system` statement using an external program to create a PDF version of the `.eps` file with the same bounding box.

Many other formats can be created.

Copy figure and Word

If you wish to put the figure in a Word document then the following are possibilities.

- ▶ Include a PDF which has been created as described earlier.

- ▶ Select “edit” from the top bar of the figure window and then select “copy figure”. The copy can be pasted into a Word document that is open.

Remarks about quality

- ▶ For a smooth curve use enough points for the x and y vectors so that it does look smooth.
- ▶ Take care with the scaling and the limits so that the most important parts fit nicely into the window.
- ▶ Take care with the line thickness and font size if you plan to re-size the graphics when you include it in a document.
- ▶ Using screen images and using formats such as `.jpg` or `.png` may be easy to do but there is likely to be a noticeable reduction in the quality in a paper document for the type of graphics described in this session.