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.