MATH 3341 — Spring 2020
Lab 04: Plotting Data

Download `Math.3341.Lab.04.zip`, unzip it by following the Windows Instructions on WyoCourses. Change the current working directory of MATLAB to the unzipped folder, and type `edit lab_04_script` in the Command Window.

1   BASICS OF PLOTTING FUNCTIONS

(a) Plot $y = x^3$. Define a vector `x`, of which the range is from -10 to 10 with step size 4, then define `y` by aforementioned y. Plot in `subplot(2, 2, 1)`. Add labels `$x$`, `$y$` to x, y axis, respectively, and add title `$y = x^{3}$ (step size = 4)`.

(b) Repeat (a) but change the step size of vector `x` to 0.1, and put the plot in `subplot(2, 2, 2)`. Observe the difference between two plots.

(c) Plot the curve $(x(t), y(t))$ whose parametrization is

$$\begin{cases} x(t) = 13\sin^3 t, \\ y(t) = 13\cos t - 5\cos 2t - 2\cos 3t - \cos 4t, \end{cases} \quad t \in [0, 2\pi]. \tag{1.1}$$

First, define a vector `t` using `linspace`, then define `x`, `y` by (1.1). Plot in `subplot(2, 2, 3)` with *red dash-dot* line. Add labels, title as shown in the third plot of Figure 1.

(d) Plot the curve $(x(t), y(t))$ whose parametrization is

$$\begin{cases} x(t) = 4\sin\frac{24t}{25}, \\ y(t) = 3\sin t, \end{cases} \quad t \in [-25\pi, 25\pi]. \tag{1.2}$$

First, define a vector `t` using `linspace` with 5000 entries, then define `x`, `y` by (1.2). Plot in `subplot(2, 2, 4)`. Add labels, title as shown in the fourth plot of Figure 1.
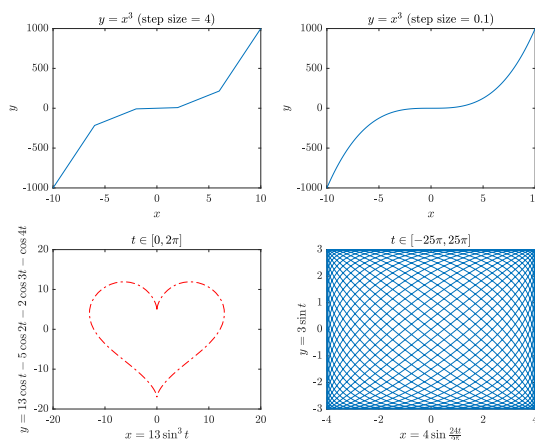

Figure 1: Expected Result for Part 1

2   SET PROPERTIES FOR PLOTTING

(a) Define x, which ranges from 0 to 2π with 1000 points, and define y1, y2, and y3 as follows

$$y_1 = \sin(x/2), \quad y_2 = \sin(x), \quad y_3 = \sin(2x).$$

(b) Plot y1, y2, y3 versus x in the same figure window with line style ('LineWidth', 2), legend, labels, grid, and title in Figure 2. Change the range of x-axis to $[0, 2\pi]$, and that of y-axis to $[-1, 1]$.

(c) Use set to set the following properties:

- XTick to [0, pi / 2, pi, 3 * pi / 2, 2 * pi];
- XTickLabel to {'0', '$\pi/2$', 'π', '$3 \pi/2$', '2π'};
- GridLineStyle to '--';
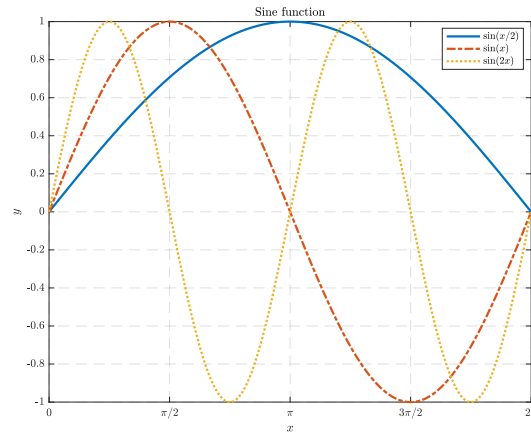- Box to 'on';
- BoxStyle to 'full'.

Figure 2: Expected Result for Part 2

3   PLOTTING PIECEWISE FUNCTION ON DIFFERENT SCALES

(a) Define x to be a vector from 0 to 10 with step size 0.01, and the piecewise function y as below

$$y = \begin{cases} \frac{e^8}{8}x & x \le 8, \\ e^x & 8 < x. \end{cases}$$

(b) In subplot(2, 2, 1), use plot to plot y versus x. Set grid minor, add labels and title as shown in the first plot in Figure 3.

(c) Repeat (b), then set y-axis to log scale using set(gca, 'YScale', 'log');.

(d) Repeat (b), but use semilogy to plot y versus x instead.

(e) Combine the first and the third figure in subplot(2, 2, 4) using plotyy, then add labels, title, etc. as shown in the fourth plot in Figure 3.
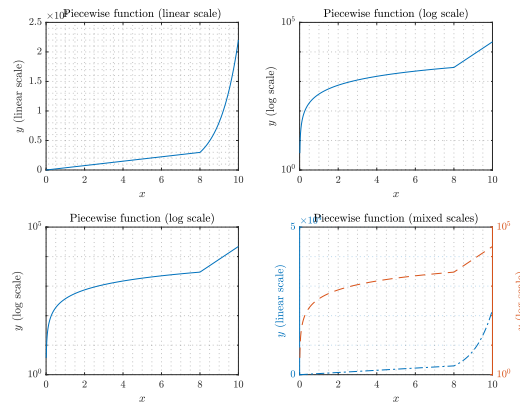
Figure 3: Expected Result for Part 3

4   Save Plots

Use the following script to save the figures.

```
1  prefix = 'lab_04_plot_';
2  for i = 1:3
3      name = strcat(prefix, num2str(i));        % Set filename for figure i
4      fig = figure(i);                          % Set figure i as current figure window
5      set(fig, 'PaperPositionMode', 'auto');    % Set paper position mode to 'auto'
6      pos = get(fig, 'PaperPosition');          % Get figure window paper position
7      set(fig, 'PaperSize', [pos(3) pos(4)]);   % Set figure paper size
8      print(fig, '-dpdf', name);                % Save figure
9  end
```

Once you finish, upload the script file lab_04_script.m to the folder src, figure files lab_04_plot_1.pdf, lab_04_plot_2.pdf, and lab_04_plot_3.pdf to the folder figure on Overleaf. Recompile, and submit the generated .pdf file to WyoCourses.