

MATH 3341 — Fall 2019

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

- Plot $y = x^3$. Define a vector \mathbf{x} , of which the range is from -10 to 10 with step size 4 , then define \mathbf{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).
- Repeat (a) but change the step size of vector \mathbf{x} to 0.1 , and put the plot in `subplot(2, 2, 2)`. Observe the difference between two plots.

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

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

First, define a vector \mathbf{t} using `linspace`, then define \mathbf{x}, \mathbf{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.

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

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

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

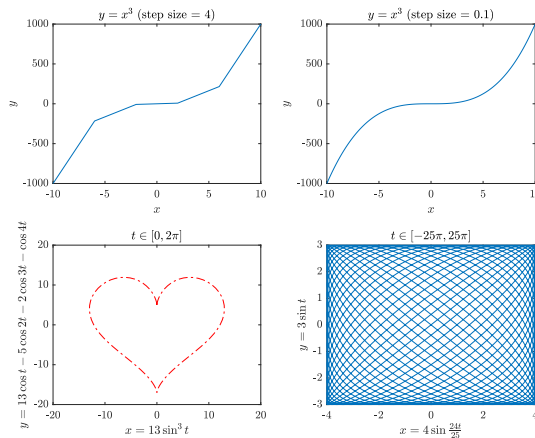


Figure 1: Expected Result for Part 1

2 SET PROPERTIES FOR PLOTTING

(a) Define x , which ranges from 0 to 2π with 1000 points, and define y_1 , y_2 , and y_3 as follows

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

(b) Plot y_1 , y_2 , y_3 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 $\{ '0', '\pi/2', '\pi', '3 \pi/2', '2\pi' \}$;
- `GridLineStyle` to `--`;
- `Box` to `'on'`;
- `BoxStyle` to `'full'`.

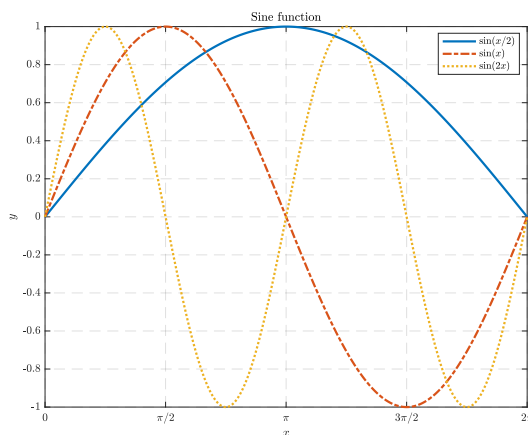


Figure 2: Expected Result for Part 2

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

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

(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.

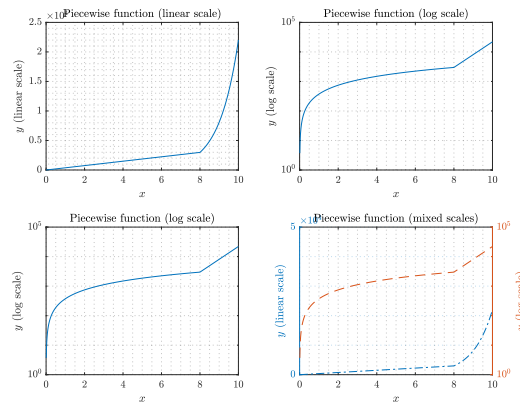


Figure 3: Expected Result for Part 3

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.