MATLAB Marina: Plotting 2D

Exercises

1. Write a MATLAB program that will plot $g(t) = 4t^3 - 2.5t^2 + 3.3t + 2.1$ versus t for the range $-5.0 \le t \le 5.0$. The plot of $g(t)$ should be a solid black line and the plot should have an appropriate title and axis labels.

2. Write a MATLAB program that will plot $g(t) = 4t^3 - 2.5t^2 + 3.3t + 2.1$ along with its first $\dot{g}(t)$ and second $\ddot{g}(t)$ derivatives on the same axes. The first and second derivatives of the function can be determined by hand so the formulas for each can be evaluated. The plot of $g(t)$ should be a solid blue line, the plot of $\dot{g}(t)$ should be a dashed green line, and the plot of $\ddot{g}(t)$ should be a dotted red line. The plot should have appropriate axis labels and title and include a legend.
   - Think about what a good time range to plot this over is and how many points are needed for the plots to look smooth.
   - Would this data be better represented by three separate plots (or three subplots) one for $g(t)$, one for $\dot{g}(t)$, and one for $\ddot{g}(t)$ rather than plotting all three functions on the same axes?

3. Write a MATLAB program that will plot $x_1(t) = 8\cos(50\pi t)$ and $x_2(t) = 5\cos(150\pi t + \frac{\pi}{2})$ on the same axes. The plot should show at least one period of each sinusoid and should have an appropriate title and axis labels. For a sinusoid to look smooth (since MATLAB linearly interpolates between points when joining points with lines) one needs 10 to 25 points per period of the highest frequency sinusoid. The plot should have appropriate axis labels and a title.

4. Write a MATLAB program that will plot $x(t) = 8\cos(50\pi t) + 5\cos(150\pi t + \frac{\pi}{2})$ for $0 \le t \le 0.1$ s and $x(t)$ for $0.05 \le t \le 0.075$ s on separate axis (subplots) in the same figure window tiled vertically. The plots should have appropriate titles and axis labels. Rather than generate separate arrays for the two time ranges, generate $x(t)$ for the longer time range and then use a comparison and indexing to extract the portions of t and $x(t)$ needed for the second plot. The plots should have appropriate axis labels.

5. Write a MATLAB program that will plot the piece-wise function $h(t) = \begin{cases} e^{-1.6t} & 0 \le t \le 0.8s \\ 0 & t > 0.8s \end{cases}$ using a time interval of 0.05s. The plot should only show the evaluated points with no line. Use black circles for the point style. The plot should have appropriate axis labels and a title.

6. Write a MATLAB program that will plot the discrete-time signal $x[n] = 8\cos(0.2\pi n)$ for $0 \le n < 25$. For a discrete-time signal, the independent variable n is integer valued, n = 0, 1, 2, … and a stem plot should be used.

7. Write a MATLAB program that will plot the curve traced by the functions: $x(\theta) = 2\sin(2\theta)$ and $y(\theta) = -\cos(2\theta)$ for the angle range $0 \le \theta \le 4\pi$ radians. Hint: this is a 2D parametric plot.

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