Practice Exercises: Graphing Functions Using MATLAB

Problem 1: The equation for a 10 Hz sine wave with an amplitude of 3 is $3\sin(2\pi(10)t)$. A frequency of 10 Hz means the sine wave completes 10 cycles in 1 second. Answer each of the following questions:

How much time does one cycle (period) of a 10 Hz sine wave take? _____

How much time does six cycles of a 10 Hz sine wave take? _____

What does this command do in MATLAB? `>> t = 0:0.001:0.6`

What does this command do in MATLAB? `>> y = 3*sin(2*pi*10*t)`

What does this command do in MATLAB? `>> plot(t,y)`

Execute the following statements and explain why the plot doesn't look like a sine wave:

```
>> t = 0:0.02:0.6
>> y = 3*sin(2*pi*10*t)
>> plot(t,y)
```

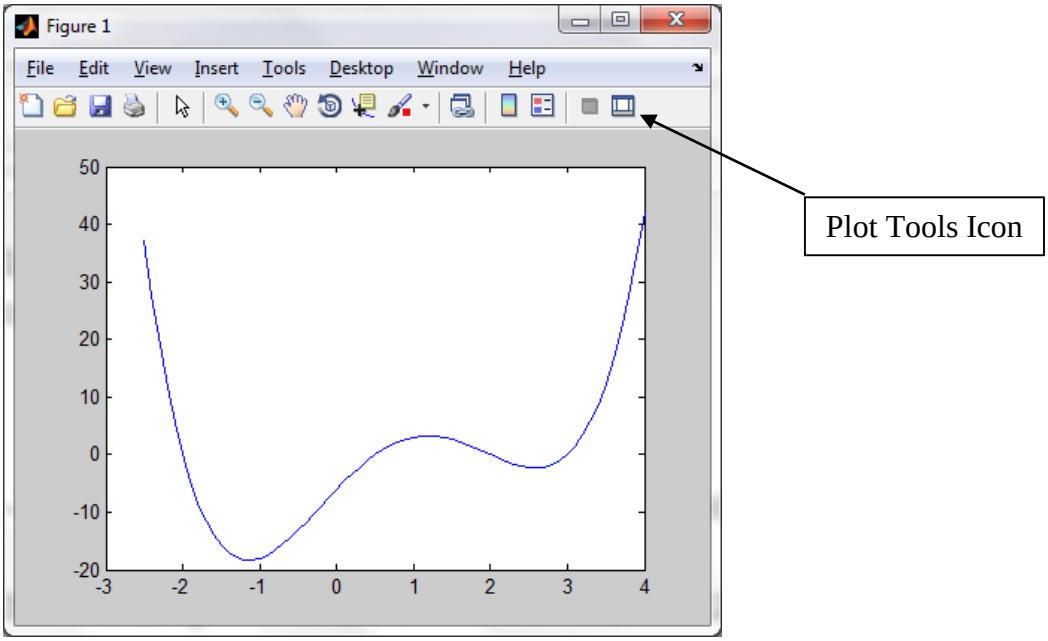
Execute the following statements and explain why the plot doesn't look like a sine wave:

```
>> t = 0:0.001:100;
>> y = 3*sin(2*pi*10*t);
>> plot(t,y);
```

Problem 2: Plot the polynomial $f(t) = t^4 - 3.5t^3 - 2.5t^2 + 14t - 6$ from t = –2.5 to 4.

- Click on the plot tools icon as shown in the figure below.
- Use plot tools to add a label on the x-axis, a label on the y-axis, a title, and a grid. Also change the color of the graph to something other than blue.
- Use the data cursor to estimate all of the roots of the polynomial

Estimated Roots: _____



Problem 3: Plot the function $f(t) = e^{-5t}$ for t = 0 to 2. ***Be sure to use exp(–5*t), do not use exp^(–5*t) or e^(–5*t).*** Use MATLAB commands (***not plot tools***) to add labels to the x-axis and y-axis, a title, and a grid.

Problem 4: Plot the functions $f_1(t) = e^{-8t}$, $f_2(t) = e^{-10t}$, and $f_3(t) = e^{-12t}$ on the same graph. Make sure to pick a good range for t to effectively display these graphs. This may require a bit of experimentation on your part. Add a title and label the x-axis. Also, add a legend.

Problem 5: Plot tan(x) from $-3\pi/2$ to $3\pi/2$. Since tan(x) is undefined (approaches ∞) at odd multiples of $\pi/2$, your graph will look seriously distorted because the values are so huge as the angle approaches the asymptotes that the smaller values get swamped out. Minimize your figure window – don't close it. Now, use the axis command: >> ***axis([-3*pi/2 3*pi/2 -10 10])*** to make a better plot of tan(x) from $-3\pi/2$ to $3\pi/2$. The axis commands specifies a range for the x-axis ($-3\pi/2$ to $3\pi/2$) and a range for the y-axis (-10 to 10). Using the axis command after the plot statement will re-set the axis. ***Note: The axis can also be re-set using plot tools.***

Problem 6: The subplot command splits the figure window into several sub-windows. The first two entries in subplot show how the window is to be split up by specifying number of rows and number of columns. The third entry points to a particular sub-window. So, subplot(3,2,4) would divide the plot window into 3 rows and 2 columns allowing for 6 smaller plot windows and would point to the 4th sub-window (2nd row – 2nd column).

Use the subplot command to plot each of the following functions in a separate sub-window:

- 4 cycles (periods) of a 5 Hz sine wave with an amplitude of 3 (i.e., $3\sin(2\pi(5)t)$). Use the 3rd argument (***not plot tools***) in ***plot*** to make the sine wave a black solid curve.
- 3 cycles of a 1000 Hz cosine wave with an amplitude of 5. Use the 3rd argument (***not plot tools***) in ***plot*** to draw a magenta solid curve with diamond data points.