MATLAB as a Complex Number Calculator

- Functions used: `real()`, `imag()`, `abs()`, `angle()`
- Compare the three angle producing functions: `angle()`, `atan2()`, and `atan()`

Practice Problems (very similar to Set #1)
For each of the problem below work out the answer using both MATLAB and your calculator

1. Write $127-j75$ in polar form; find the angle in both radians and degrees.

   ```matlab
   >> z = 127 - j*75;
   >> abs(z) = _________________
   >> angle(z) = _________________
   ```

   Hand/Calculator workspace:

   ```plaintext
   127  
   j  
   -  
   75
   ```

   Using a TI-89:
   ```plaintext
   \( (127 - j \cdot 75) \cdot \text{Polar} \)
   \( e^{-0.533443 \cdot j \cdot 147.492} \)
   \( \text{angle}(127 - j \cdot 75) = 180^\circ \)
   \( \pi \)
   \( -30.564 \)
   ```

   2. Write $z = 22 \angle -110^\circ$ in rectangular form.

   ```matlab
   >> z = 22*exp(-j*110*pi/180);
   >> _______________________________________________
   >> _______________________________________________
   ```

   ```plaintext
   z
   ```
Hand/Calculator workspace:

3. Evaluate $z = (15 - j37) - 60^\circ$ to a rectangular form solution.

**MATLAB Steps:**

Hand/Calculator workspace:

4. Evaluate $z = (15 - j37)/60^\circ$ to a polar form solution.

**MATLAB Steps:**

Hand/Calculator workspace:
MATLAB for Plotting Data and Functions

- Functions used: `plot()`, `xlabel()`, `ylabel()`, `title()`, `grid`, and `axis`

1. Plot $x(t) = 25 \sin \left( \frac{\pi t}{5} + \frac{\pi}{4} \right)$ for $0 \leq t \leq 15$ s. Include a grid and axis labels.
   
   $t = 0:.1:15$; % create a time axis vector with sample spacing 0.1s

   >> t = 0:.1:15; % create a time axis vector with sample spacing 0.1s

   For the $x(t)$ above, plot $x(t - 2)$ for $0 \leq t \leq 15$ s, overlaid on the plot of $x(t)$ of part (1).

   >> hold on % will hold the previous plot so you can overlay a new plot

   >> ?
User Defined Functions in MATLAB

One of the most powerful capabilities of Matlab is being able to write your own user defined functions. Consider a custom trig function of the form

\[ y(t) = 3\cos(5t) + 4\sin(3t) \]  

(1)

The input to this function is time, \( t \), and the output is \( y \). The function prototype we require is of the form:

```matlab
function y = my_trig(t)
% y = my_trig(t) is a function that evaluates the simple trig
% based function y = 3*cos(5t) + 4*sin(3*t).
% % Author: My Name
% % Date: January 2011
% % ...
% ...
function body
% ...
make sure that you return output to variable y
```

Write the Function

Test the Function

To test the function input a time vector that runs from -2s to 10s using a time step of 0.05s. Output the results in a plot using `plot(t,y)`. 