PHYS 210: Introduction to Computational Physics MATLAB Exercises 1

The following initial instructions only apply if you do not already have a `matlab` session running from within the directory `~/matlab`

> *Initial instructions:* Open a terminal window, change to the directory `~/matlab` that we previously created, and start `matlab` in that directory (and in the background). Specifically, execute the following (bash) command sequence
>
> ```
> % cd
> % cd matlab
> % matlab &
> ```
>
> If, for whatever reason, `~/matlab` does not exist, create it with the following commands
>
> ```
> % cd
> % mkdir matlab
> ```
>
> then execute the first set of commands.

Using your text editor, and again working within `~/matlab`, create a file named `ex1.m` that contains `Matlab` commands to perform calculations as enumerated below. Note that `ex1.m` will be a `Matlab` *script*.

IMPORTANT! Be sure that you create/save `ex1.m` in the directory `~/matlab`.

As you enter commands in `ex1.m` to answer each problem, save the file, then execute the commands (in the entire file) by typing `ex1` at the `matlab` prompt:

```
>> ex1
```

Correct syntax errors and other gaffes that you detect as you go along, being sure to re-save `ex1.m` whenever you make a change.

If the above procedure doesn't seem to be working for you, ask for help. In particular, if you see the following error message

```
>> ex1
Undefined function or variable 'ex1'.
```

then it is probable that one or more of the following is true:

- You didn't start `matlab` from the command line, and from within the directory `~/matlab`
- You didn't name the file that contains the `matlab` commands `ex1.m`
- You didn't save `ex1.m` in the directory `~/matlab`.

Here we go ...

1. Problems from Gilat, Ch. 1.10

1.2a) Calculate

$$23\left(-8+\frac{\sqrt{607}}{3}\right)+\left(\frac{40}{8}+4.7^2\right)^2$$

assigning the value to the variable `res2a`

1.4a) Calculate

$$\cos\left(\frac{5\pi}{6}\right)\sin^2\left(\frac{7\pi}{8}\right)+\frac{\tan\left(\frac{\pi}{6}\ln 8\right)}{\sqrt{7}+2}$$

assigning the value to the variable `res4a`

1.6a) Define the variables x and z as $x = 5.3$, and $z = 7.8$, then evaluate:

$$\frac{xz}{(x/z)^2}+14x^2-0.8z^2$$

assigning the value to the variable `res6a`

1.16) The distance d from a point (x_0, y_0) to a line $Ax + By + C = 0$ is given by:

$$d=\frac{|Ax_0+By_0+C|}{\sqrt{A^2+B^2}}$$

Determine the distance of the point $(-3, 4)$ from the line $2x - 7y - 10 = 0$. First define the variables A, B, C, x_0 and y_0, and then calculate d. (Use the `abs` and `sqrt` functions).

2. Problems from Gilat, Ch. 2.11

2.1) Create a row vector named `res21` that has the elements 6, $8 \cdot 3$, 81, $e^{2.5}$, $\sqrt{65}$, $\sin(\pi/3)$ and 23.05

2.2) Create a column vector named `res22` that has the elements 44, 9, $\ln(51)$, 2^3, 0.1 and $5\tan(25^\circ)$.

2.9) Create the matrix shown below by using the vector (colon) notation for creating vectors with constant spacing and/or the `linspace` command when entering the rows.

$$B=\begin{bmatrix} 0 & 4 & 8 & 12 & 16 & 20 & 24 & 28 \\ 69 & 68 & 67 & 66 & 65 & 64 & 63 & 62 \\ 1.4 & 1.1 & 0.8 & 0.5 & 0.2 & -0.1 & -0.4 & -0.7 \end{bmatrix}$$