IDC101 (Introduction to Computation) :
Lab session 6

For all the problems given here, you will have to use `matplotlib` and `numpy` modules.

1. Create a list of 10 values for temperature in Farenheit scale. Write a program to convert from Fahrenheit to Celcius. Use `numpy array` functionality to do the same task.

2. Let *x* list of values from 0 to 4 pi. Create this list. Now, compute the values $y = \sqrt{2.3x^2 + x}$ using function. Plot this function using `matplotlib`.

3. Use `matplotlib.pyplot` and `numpy array` functionality to plot *y* as a function of *x* that was computed in problem 2.

4. Using `matplotlib`, plot the following functions as a function of *x* for *x* ranging between -1 and 1. Label the axes.
f(x) = |*x*|
f(x)= x^2
f(x) = sqrt*(x)*
f(x) = exp*(-x)*
f(x) = exp*(-x^2/2)*
f(x) = $\sin^2(x)\ cos^3(x)$

5. Use numpy to create a one-dimensional array for x ranging between 0 and 4π with increment 0.1. Use this array to compute values for `sin` and `cosine` functions and plot using `matplotlib` module.

6. Let A_x be a matrix of the following type;

$$A_x = \begin{bmatrix} \cos x & -\sin x \\ \sin x & \cos x \end{bmatrix}$$

Now, use `arrays` in `matplotlib` to construct two matrices A_{25} and A_{45}.
Write a program that will find the product of these two matrices $C = A_{25}\ A_{45}$.

7. Generalise your program to compute the product of two matrices *A* and *B* of order *N* by *N*. Take *N* to be a user given input.
The elements of the first matrix should be $A_{ij} = i$ x *j, where i=1,2...N and*

j=1,2,....N. The elements of the second matrix should be $A_{ij} = i/j$.

8. Create a list of 100 numbers using the formula $y = \sin(x) - 2\sqrt{x^3}$. Generate your own list for *x*. Think about what kind of *x* should be generated. Plot your result. Use math module to compute the value of `sine` function. Repeat the exercise using `numpy arrays`.

9. Using `matplotlib`, plot the function `exp(-x)` and then independently generate a list and compute `exp(-x)`. Now, plot both the results on the same graph. The generated list should be plotted as a dots, while the function to be plotted must be a continuous curve.