APSC 1001 & CS1010

Introduction to Plotting with Python

```
import matplotlib.pyplot as plt
```

Dr. Kartik Bulusu, MAE Dept.

Teaching Assistants:
Sara Tenaglio, BME Dept.
Catherine Karpova, BME Dept.
Zachary Stecher, CEE Dept.

Learning Assistants:
Jonathan Terry, CS Dept.
Ethan Frink, MAE Dept.
Jack Umina, CS Dept.
Olivia Legault, CS Dept.
Alexis Renderos, MAE Dept.

GW School of Engineering & Applied Science
THE GEORGE WASHINGTON UNIVERSITY
Fall 2021

Photo: Kartik Bulusu

Photo: Kartik Bulusu

Plotting data; the very basics

`x-values` and `y-values` are vectors containing the x- and y coordinates of points on the graph.

```
>>> import numpy as np
>>> import matplotlib.pyplot as plt
>>>
>>> plt.plot(x-values, y-values, 'style option')
>>> plt.show()
```

Color Style-option	Line Style-option	Marker Style-option
y yellow	- solid	+ plus sign
m magenta	-- dashed	o circle
c cyan	: dotted	* asterisk
r red	-. dash-dot	x x-mark
g green	none no line	. point
b blue		^ up triangle
w white		square square
k black		diamond diamond

Programming pitfall: The two vector arguments x-values and y-values MUST have the same length.

Photo: Kartik Bulusu

Plotting Example in Python

I have three functions:

$$y1 = \sin x$$
$$y2 = x$$
$$y3 = x - \frac{x^3}{3!} + \frac{x^5}{5!}$$

I would like to generate 100 values between 0 and 2π radians.

```
>>> import numpy as np
>>> import matplotlib.pyplot as plt
>>> import math as mt
```

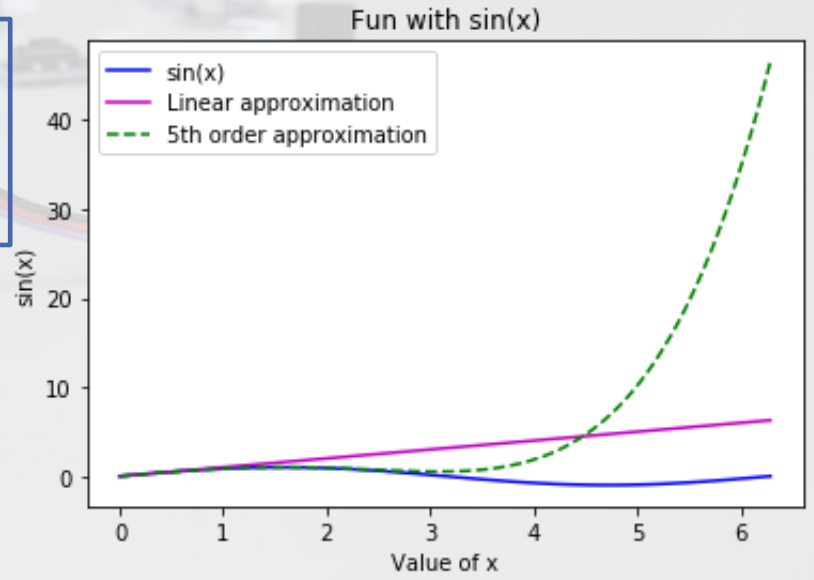
```
>>> x = np.linspace(0,2*np.pi,100)
>>> y1 = np.sin(x)
>>> y2 = x;
>>> y3 = x - (x**3/mt.factorial(3))+(x**5/mt.factorial(5))
```

```
>>> # plt.figure()
>>> plt.plot(p, q1, 'b', label='sin(x)')
>>> plt.plot(p, q2, 'm', label='Linear approximation')
>>> plt.plot(p, q3, 'g--', label='5th order approximation')
```

```
>>> plt.xlabel('Value of x')
>>> plt.ylabel('sin(x)')
>>> plt.title('Fun with sin(x)')
```

```
>>> plt.legend()
>>> plt.show()
```

I would like to plot three curves in one single plot !!



School of Engineering & Applied Science
THE GEORGE WASHINGTON UNIVERSITY

GW

Prof. Kartik Bulusu, MAE Dept.

Fall 2021

APSC 1001 Introduction to Engineering for Undeclared Majors
CS 1010 Computer Science Orientation