Tutorial Introduction to Python

1. Given a function $f(x) = 0.5 + sin(\pi x)$ with the interval of $x \in [0.25,1.25]$. Write a python program using user define statement to call the function and plot your function using matplotlib. Label your x and y-axis as 'x' and 'y'.

2. Using the same function, we are going to perform a numerical integral and we can write our integral as

$$\int_{0.25}^{1.25} 0.5 + sin(\pi x)$$

   We are going to use Simpson's rule and this rule can be called from Scipy module, scipy.integrate. From the integration, what is your answer?

3. Next, we use Monte-Carlo integration to obtain estimate for our function. First we need to generate random number using numpy random uniform for sampling (use size = 1000 and increase the size accordingly – but do carefully not to crash your computer!) and find the estimate under the area. Compare your answer with Step 2.