```
#Computational Physics: 23-08-2021 Problem 1
#python libraries used for this code
import numpy as np
import matplotlib.pyplot as plt
n_iterations = 10000 #declare number of iterations
pies_list = [] #define empty array for pies
diff_list = [] #define empty array for the absolute error
#for loop to loop through defined number of iterations
for i in range(n_iterations):
    darts = 0 #initalize dart throws to zero
    circle = 0 #initalize darts inside circle to zero
    square = 0 #initalize darts inisde square to zero
   #while loop (executes a set of statements as long as a condition is true)
    while darts <= i:
        x = np.random.uniform() #random number generator
        y = np.random.uniform() #random number generator
        #if statement adding darts to circle list if condition is met (within radius of circle)
        if (x*x + y*y) <= 1.0:
            circle += 1.0
        darts += 1 #adds number to dart count
    pies_list.append(4*(float(circle)/float(darts))) #calculates pi value and adds
to pies_list array
   #abs error is difference between exp. value and true value
    diff_list.append(np.pi- abs(4*(float(circle)/float(darts)))) #calculates
the absolute error and adds to diff_list array
#plot commands for pie estimates
plt.plot(np.arange(0, n_iterations, 1), pies_list, color="blue",
label="Pie Estimates")
plt.hlines(y=np.pi, xmin=-1.0, xmax=1200.0, linestyles="--",
color="black", label="True Pi")
plt.legend()
plt.xscale("log")
plt.xlabel("Number of Darts")
plt.ylabel("Pi Estimate")
plt.show()
#plot commands for absolute difference of pi
plt.plot(np.arange(0, n_iterations, 1), diff_list, color="red",
label="Absolute Error")
plt.legend()
plt.xscale("log")
plt.xlabel("Number of Darts")
plt.ylabel("Absolute Difference")
plt.show()
```