Lab #6 Physics with Python I: Plotting

A. Complete this:

YOUR NAME: Danny Hong   SLOT: 139

PLEASE MARK THE CIRCLE NEXT TO YOUR LAB SECTION

- ○ A, Prof Yecko, Tue 2-4PM
- ○ B, Prof Debroy, Wed 10-12noon
- ○ C, Prof Yecko, Thu 11-1PM
- ✓ D, Prof Yecko, Fri 12-2PM
- ○ S, Prof Yecko, Tue 10-12noon

B. Read and sign Academic Integrity Statement:

I hereby attest that I have not given or received any unauthorized assistance on this assignment.

Danny Hong

Sign here

C. Grading rubric:

CATEGORY AND VERY BRIEF GRADING COMMENTS..........	PTS AVAILABLE	PTS EARNED
Purpose	2	
Double Slit Plot	4	
N-slit Plot	4	
Single Slit Plots	8	
Question	1	
Conclusion	1	
Total	20	

Purpose:

For this lab, the Python coding language was used to plot and display different intensity patterns of light. The program was coded using Google CoLab and version 3 of Python was used. When modeling and plotting the different intensity patterns, respective equations were used to model each condition. Additionally, the importance of correctly labeling and captioning each plot was emphasized.

Figure 1: Provided Plot

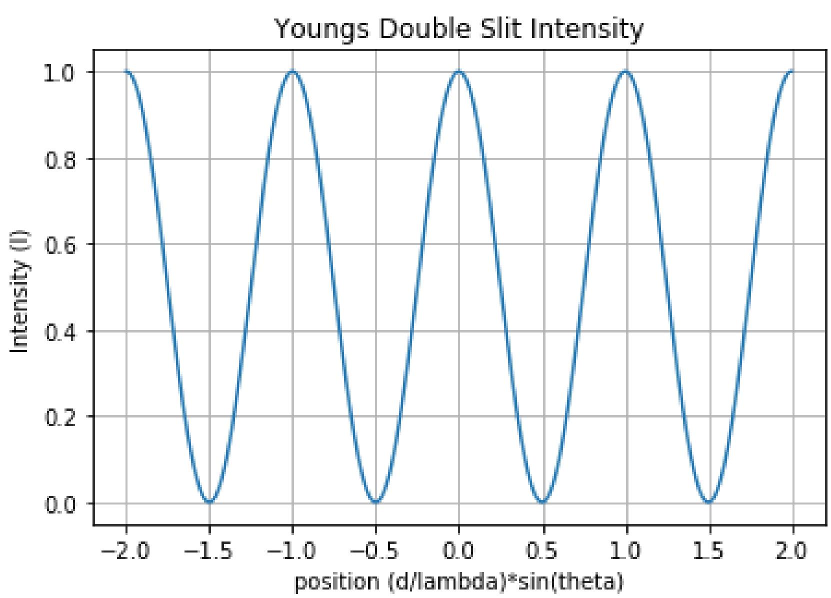
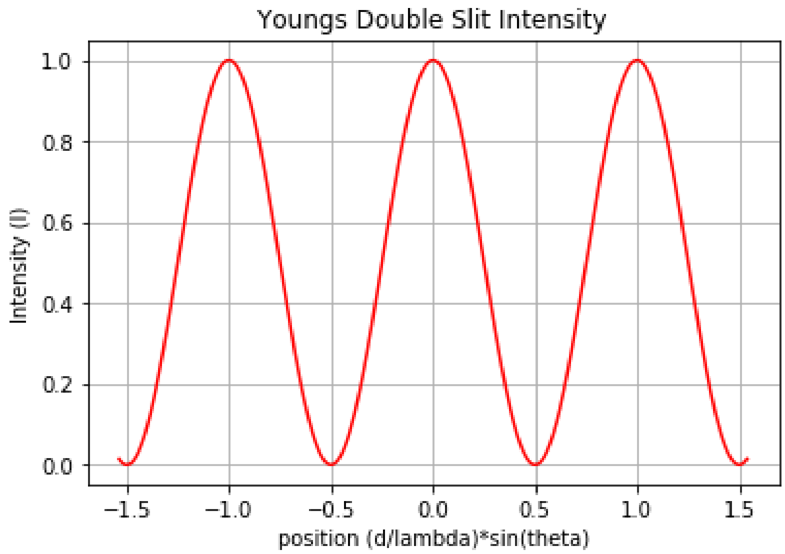


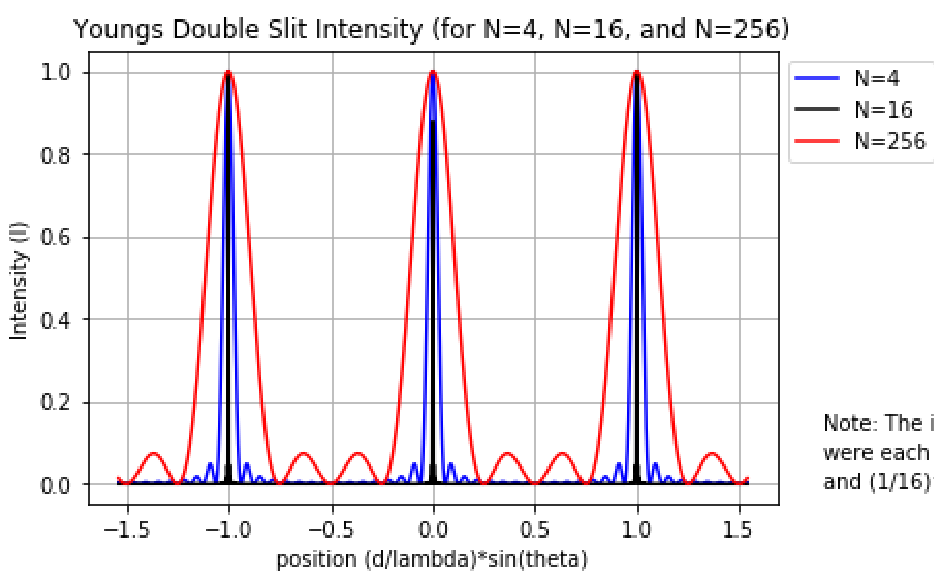
Figure 2: Plot for Young's Double Slit Interference:



Note: theta=np.linspace(-np.pi/2.0, np.pi/2.0, 1000) was used to create the graph in place of arange

This is the graph of the intensity pattern that is created by red light (650 nm wavelength) and 2 slits that are infinitessimally tiny in width. The slits are placed 1.0µm apart and both the zero and first order peaks are shown.

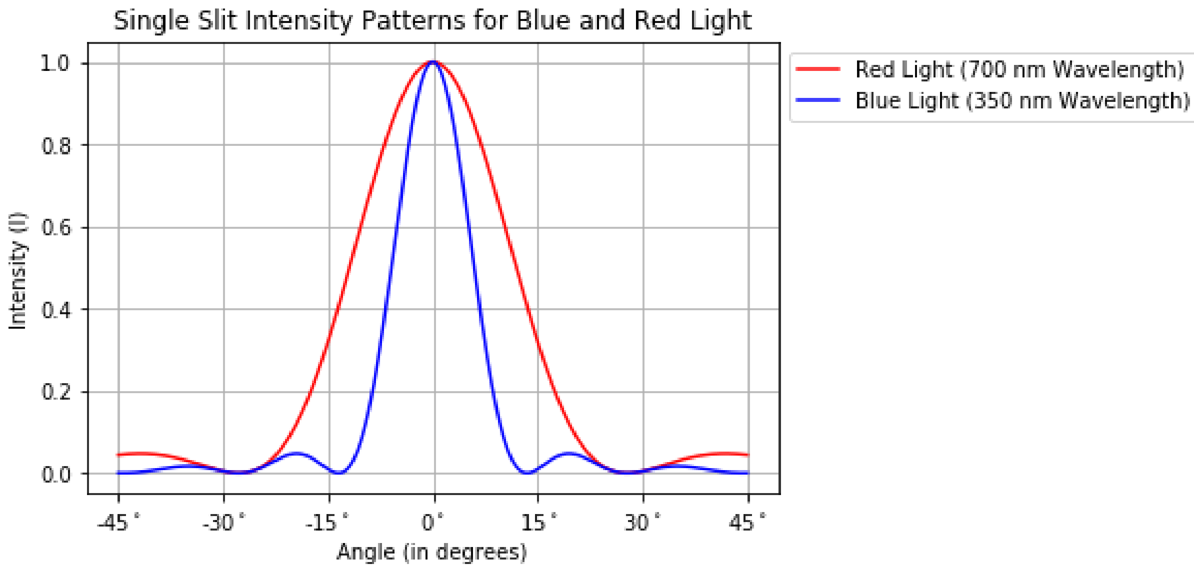
Figure 3: Plot for N-Slit Interference:



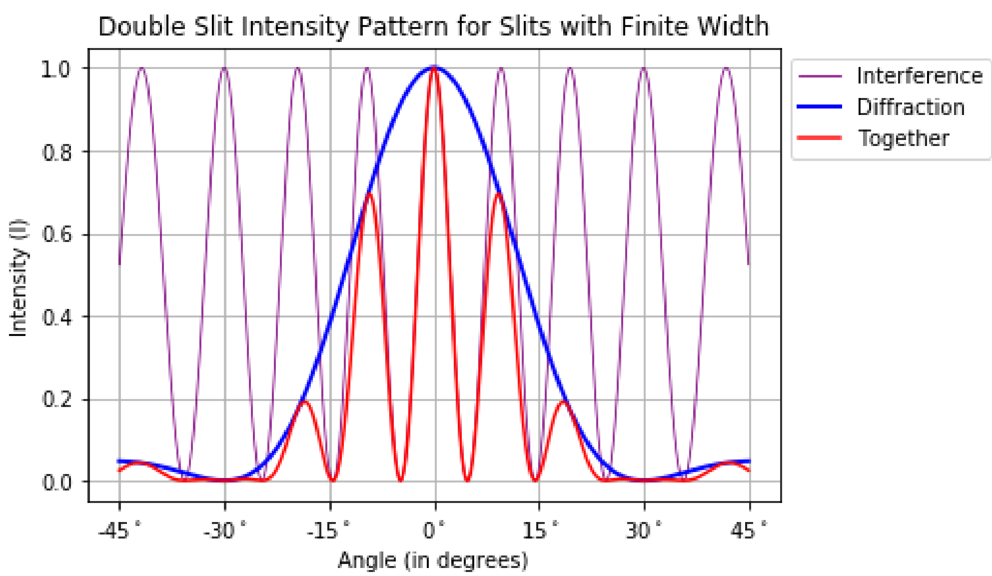
Note: The intensity of N=4, N=16, and N=256 were each scaled by factors of (1/16), (1/16)^2 and (1/16)^4 respectively for better comparison.

These are the intensity pattern graphs produced by red light (650 nm wavelength) passing through 4, 16, and 256 slits that are infinitessimally tiny in width. The slits are placed 1.0µm apart from each other for each respective slit arrangement.

Figures 4 and 5: Plots (2) for Single Slit Diffraction:



This is the graph of the intenisty patterns produced by blue light (350 nm wavelength) and red light (700 nm wavelength) passing through a single slit with a width of 1.5µm. The angle scale (x-axis) represents the angle between the point of interest and the center of the incident beam.



This is the graph of the intensity patterns that are produced by red light (700 nm wavelength) passing through 2 slits, each with width 1.5µm. The 2 slits are placed 3.92µm apart from each other. The interference pattern that is produced by a single slit diffraction pattern with width 1.5µm and a two-slit setup (assuming that the slits are infinitessimally tiny in width) are shown alongside the main intenisty pattern (Together). The main intensity pattern represents the interference pattern scaled by the diffraction pattern.

Conclusion:

As a result of using the Python coding language, specific intensity patterns of light were successfully plotted and displayed. This lab taught individuals how to use an online coding software (Google CoLab) to effectively program (in Python) and represent patterns created by light due to its properties. Additionally, the importance of patience and persistence was emphasized especially when debugging various errors in code that either resulted in code being unable to compile or an incorrect output graph. In essence, this lab demonstrated how computer science can be employed to display scientific data.

Question:

1. The m=3 order is missing because at that point, the single slit diffraction function is equal to 0 while the YDS (Young Double Slit) interference function is equal to a nonzero positive value. Therefore, the product of those two values at m=3 is 0, which explains why the m=3 order is not present since the resulting intensity function equals 0.