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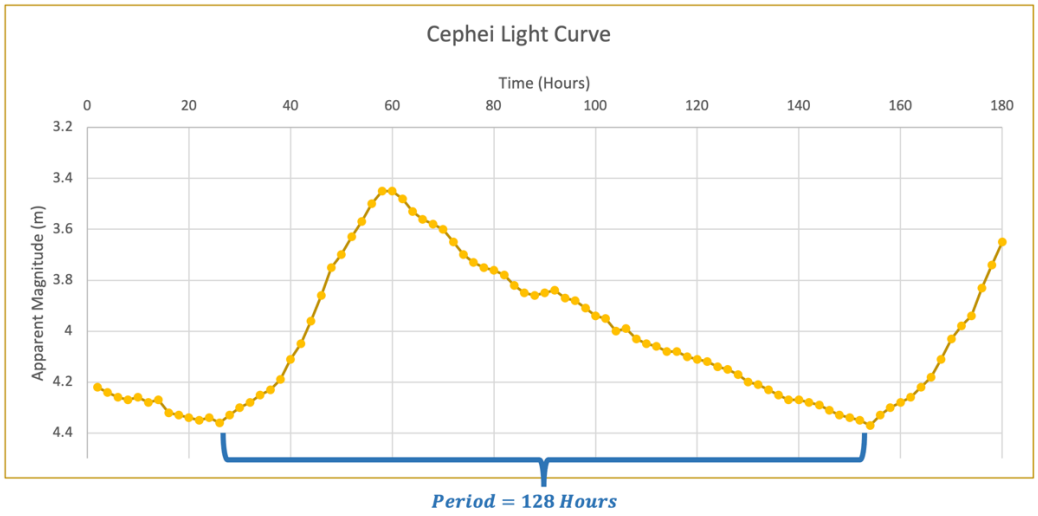
"I pledge my honor I have abided by the Stevens Honor System."

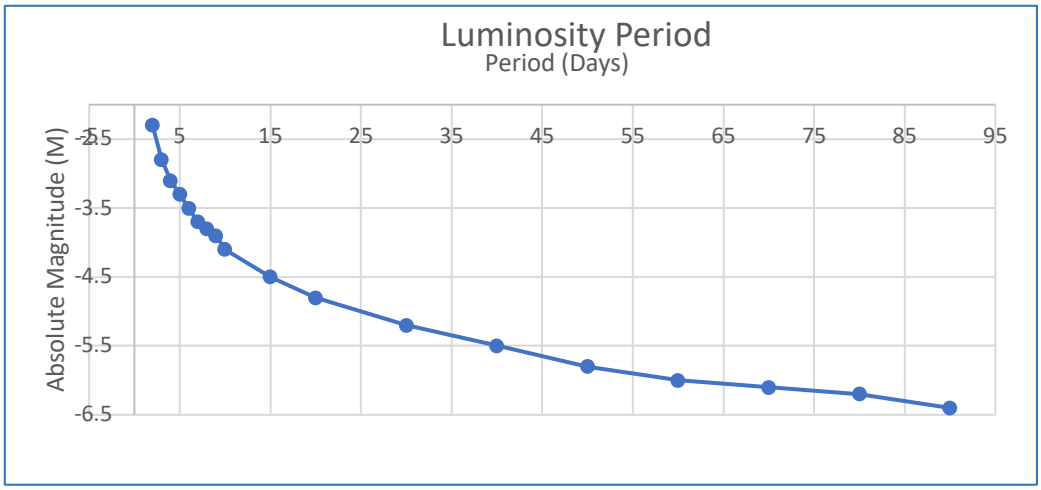
PEP 151 Lab 2 Report
Distance Determination from Cepheid Variable Stars

I. Introduction

The objective for this lab was to experiment with finding cosmic distances. As we know, it is not currently possible to physically measure the distance from Earth to nearby star systems, such as the Cepheids, with a "cosmic tape measurer," so instead, we must delve into the concept of Newtonian Astrophysics to theoretically determine the distance using known laws of gravity. In this lab, this concept will be performed with "delta Cephei," using a provided set of data giving orbital period statistics, as well as luminosity statistics, from which the experimental distance value from this data will be compared to the actual value from a credible source.

II. Plots





III. Results

From the light curve above, I have determined that the pulsation period of “delta Cephei” to be 128 hours, or 5.3333 days.

From the light curve, I have also determined the average apparent magnitude of “delta Cephei” to be m = 3.91. This was done by finding the average of the largest and smallest collected value, using the formula (max + min)/2, where max = 4.37 and min = 3.45.

From the luminosity-period relation plot and use the pulsation period I have determined above; I estimate the absolute magnitude of “delta Cephei” to be M = -3.4.

Using the relation between apparent magnitude m and absolute magnitude M: $m-M=2.5 \log_{10}(d/10)^2$, I have calculated the distance d to be 289.73 parsecs.

According to data from Ohio State University, the approximate distance to “delta Cephei” is measured to be 300 parsecs. This provides a percent error of [(300 – 289.73)/289.73] • 100 = 3.5%, which is not too bad, provided that the average apparent magnitude was calculated by finding the average of the largest and smallest collected value from the data. This only incorporates two values out of the numerous others that were collected, and thus, the theoretical value was skewed as a result.