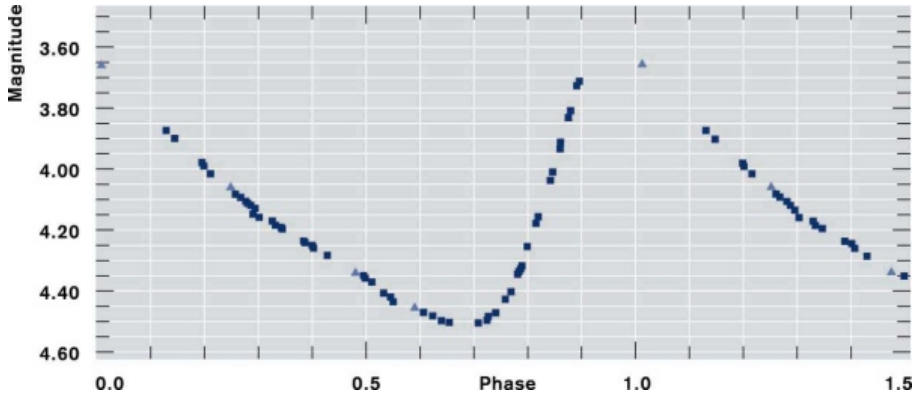
Astronomy (PY 101)

NAME _____

Project VIII: Cepheid Variables

Classical Cepheid stars are pulsating variable stars with luminosity periods between 1 and 50 days.



The Data Table below shows the (average) apparent magnitude m, distance D, and period P for ten classical Cepheids in the Aquila (Eagle) constellation.

Cepheid	Apparent Magnitude m	Distance D(kpc)	Period P(days)	Absolute Magnitude M	log P(days)
η Aql	3.90	0.33	7.18		
U Aql	6.45	1.05	7.02		
FM Aql	8.27	2.24	6.11		
SZ Aql	8.60	4.74	17.14		
TT Aql	7.14	2.14	13.75		
$V496$ Aql	7.75	1.88	6.81		
$V600$ Aql	10.04	5.60	7.24		
$V916$ Aql	10.79	11.32	13.44		
$V1162$ Aql	7.80	1.68	5.38		
$V1344$ Aql	7.77	2.00	7.48		

Complete the Data Table above by calculating the absolute magnitude

$$M \;=\; m \;-\; 5 \;\times\; \log\left(\frac{D}{10}\right)$$

and the logarithm of the period ($\log P$) for each of the ten Cepheids listed in the Table. (Note: D MUST be expressed in pc in the formula given above.)

On the graph paper provided, plot absolute magnitude (M) versus the logarithm of the Cepheid period ($\log\ P$). Once you've plotted all ten points, draw a single straightline which best fits the data (you do NOT have to compute the slope).

An astronomer discovers two new classical Cepheid stars in the Sagitarius constellation.

Star	Apparent Magnitude m	Period P(days)
W Sgr	4.55	7.59
YZ Sgr	7.39	9.55

(a) Using your graph, convert the $\log\ P$ value for each Cepheid variable into a value for its absolute magnitude M

Star	$\log\ P$	Absolute Magnitude M
W Sgr		
YZ Sgr		

(b) Using the distance-modulus formula

$$m \;-\; M \;=\; 5\ \log(D/10)$$

calculate the distance D for each Cepheid variable

Star	Distance Modulus $m - M$	Distance D(pc)
W Sgr		
YZ Sgr