**WorkSheet: Making a Phase Light Curve for your Periodic Variable Stars**

**Your Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

The reason I had you focus on just the periodic variable stars on our list, was that they follow exactly the same light curve over and over in time. That allows us to “fold” the light measurements all back into just one cycle, and get a denser plot and see more clearly what your variable star is doing. The math for doing this is extremely easy. And that’s the subject of this – your last lab project for this semester.

Here’s what you do…

Fill in the tables below, for Delta Cephei, S Sagittae, and for Eta Aquilae. Remember you were to randomly select 10 different photographs spread over time, and estimate the magnitudes of these stars and fill in the table worksheet. Now, for this lab, you’re going to do one more thing for 3 of these stars… You’re going to fold those measurements into a single cycle, and the time variable is now going to be called the “phase”…

On the following pages you’ll see 3 tables for the 3 stars I want you to do this for…

1. Copy from your original lab your trimmed Julian Dates into the first column, and your magnitudes into the far right column
2. Take your trimmed Julian Date and divide that number by the period P of your variable star. The period for Delta Cephei is 5.366249 days. The period for S Sagittae is 8.382 days. The period for Eta Aquilae is 7.177 days. After doing the division, enter the number in the second column.
3. Now strip off the part to the left of the decimal point, the integer part. All you’re left with is the part to the right of the decimal point. So for example 4.255 become 0.255. This number is called “the Phase” and is a number between 0 and 1, where 1 is 1 full period P of light variation. It’s a dimensionless number. It’s time, but expressed in units of the period of the star, not in days or hours or other typical time units.
4. Now make the input file for our plotting program found on the web, as before. So you need to make a single line text file, with phase, magnitude as the pairs, instead of days, magnitude. So, instead of trimmed Julian Date as your “x” value, you’re entering the phase. The second number in the pairs is still “magnitude”, and use this line to use our online light curve plotter to again make a plot of the magnitude vs phase now.
5. **Print this plot and send it to me**. Also **send me your single line text file that has the phase + magnitude pairs**. That way I can easily lump the whole class’s single lines into a grand longer single line and plot all the class data on a single phase plot. THAT should really show our light variations well, and match up with the predicted light curve decently!

**Delta Cephei: Period = 5.366249 days**

|  |  |  |  |
| --- | --- | --- | --- |
| Julian Date, trimmed, from original lab Divided by P Phase Magnitude | | | |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**S Sagittae: Period = 8.382 days**

|  |  |  |  |
| --- | --- | --- | --- |
| Julian Date, trimmed, from original lab Divided by P Phase Magnitude | | | |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**Eta Aquilae: Period = 7.177 days**

|  |  |  |  |
| --- | --- | --- | --- |
| Julian Date, trimmed, from original lab Divided by P Phase Magnitude | | | |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |