

**AST103  
Spring 2008**

**Lab Write-Up #1 “Sunset Lab”**

For this write-up, I encourage you to work in pairs. If you cannot find a partner, let me know before Wednesday April 2<sup>nd</sup> and I will assign you a partner. Please turn in one write-up for the group (of 2).

Due: In class, Monday April 14<sup>th</sup>. **Each lab will be graded on 100 pt scale**

Each write-up should contain the following parts:

**Objectives:** What are you trying to measure and why. **(10 pts)**

**Lab setup:** This is a description of how you made the measurements, sources of error, and any problems associated with the measurements. **(10 pts)**

**Data:** Photocopy the raw data from your notebook and include it here. **(10 pts)**

**Discussion and Conclusions:** Answer the questions posed and discuss any results you have gotten, and errors you may have discovered and why. **(40 pts)**

**Lab #1 “Sunset Lab” Analysis (30 points)**

In this part you will analyze the data and include any plots.

I know that some people had trouble getting many data points, so you may augment your data with data from Starry Night, but clearly label which data points are yours and which are from Starry Night. You will need to build up a dataset that covers the entire semester. This should be at least 2 datapoints/ week for the months of February and March, i.e. 16 datapoints.

1) Convert your measure of fingers into degrees: Step back at least 10 feet and measure the number of fingers the ruler subtends (hint: walk backwards or forwards until the ruler is just covered by an integer number of fingers). Mark and measure the distance to the wall, this is distance Y. Divide 12 inches by the number of fingers, this is distance X. The angle subtended by your finger is  $\text{Arctan}(X/Y)$ . Make sure you know whether this is in degrees or radians.

2) Make a plot of the position where the sun set (in degrees) vs. the date of the year. Measure the angle along the horizon, starting with  $0^\circ$  for North and increasing toward the East (East= $90^\circ$ , South= $180^\circ$ , West= $270^\circ$ .) This angle is known as the azimuth.

**Azimuthal plot, 2 points per week can be hand drawn or drawn on computer, Should be to scale and clearly show which data points are from StarryNight and which are observed.**

**Lab #1 “Sunset Lab” Discussion (40 points) ( 5 pts each) (extra credit worth an additional 5 pts)**

Answer the questions posed and discuss any results you have gotten, and errors you may have discovered and why

a) Does the sun always set in the same direction from your observation point?

b) If so, what is the direction (e.g.,  $10^\circ$  north of west)? If not, what is the range of directions and what is the pattern of change?

c) Did the Sun set directly west, not north of or south of west? If so, on what day or days?

d) If you see a change in the azimuth of the setting Sun with time, is the change constant, or is the change faster at certain times than others? When is it fastest?

Extra Credit: Make a plot of the rate of change in azimuth for the sunset, i.e. how many degrees/day do you observe between any two data points

e) Do you notice a correlation between the azimuth of the sunset and the time of the sunset? (Note: Remember that during Daylight Savings Time, i.e. the summer, the time you record for the sunset will be one hour “later” than it would be without Daylight Savings. Another way of saying this is that in the Spring semester, before the change to Daylight savings time, the Sun is effectively setting "one hour too early". You should take this into account when answering this question.)

Extra Credit: Make a plot of Azimuth as a function of sunset time. Does this help answer the question? (5pts)

f) What do you expect to happen to this sunset angle during the periods beginning September 21 and ending December 21 (Fall), beginning December 21 and ending March 21 (Winter), beginning March 21 and ending June 21 (Spring), and beginning June 21 and ending September 21 (Summer)? How does the sunset angle correlate with the seasons?

g) Do you think that the azimuth of the sunset will correlate with how high the Sun is in the sky at noon? If so, how?

h) Suggest the reason(s) as to why the direction of sunset does or does not change? Can this reason also explain the change in the times of the sunset?