HOMEWORK #6 ASTR 2000 FALL 2016 DUE THURSDAY OCTOBER 27TH

NAME: _____

1. Imagine for a few minutes that you are an ancient Mayan astronomer and Tsol Kin calendar keeper, and that it is the Mayan long count year 4540 (1427 CE Gregorian according to the GMT correlation; see question #3). You have traveled from your home in the highlands to the Caracol at Chichen Itza (latitude = 21 degrees north) at the time of the midwinter full moon (full moon nearest to the Winter Solstice) to verify the "heliacal rising" date for Venus according to your (adopted!) ancestors.

Helpful numbers: Venus synodic period: 584 days; Maya Haab, or Solar year= 365 days
Moon's synodic period = 29.5 days; Maya Tsol Kin sacred calendar = 260 days

a). What is meant by the term "heliacal rising"?

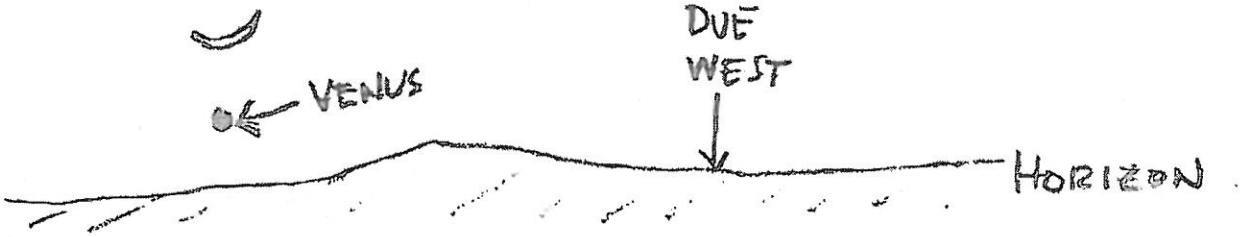
b). Does a heliacal rise of Venus occur near or at mid-winter every year at Chichen Itza? Why or why not? Explain using some numbers, please.

c). But, as an ancient Mayan astronomer, you know that this same event, a heliacal rising of Venus, will occur at the same time of year, at the time of the winter solstice, 8 years hence in 4548 (1435 CE). How accurately do these heliacal rising days in 4540 and 4548 coincide with the same month and day in the "Haab", the Mayan solar year? Explain

d). What is the lunar phase when this second heliacal rise occurs? Explain your answer. Note the relationship between the lunar phase at the time of heliacal Venus risings separated by 8 Haabs. {AMAZING!}

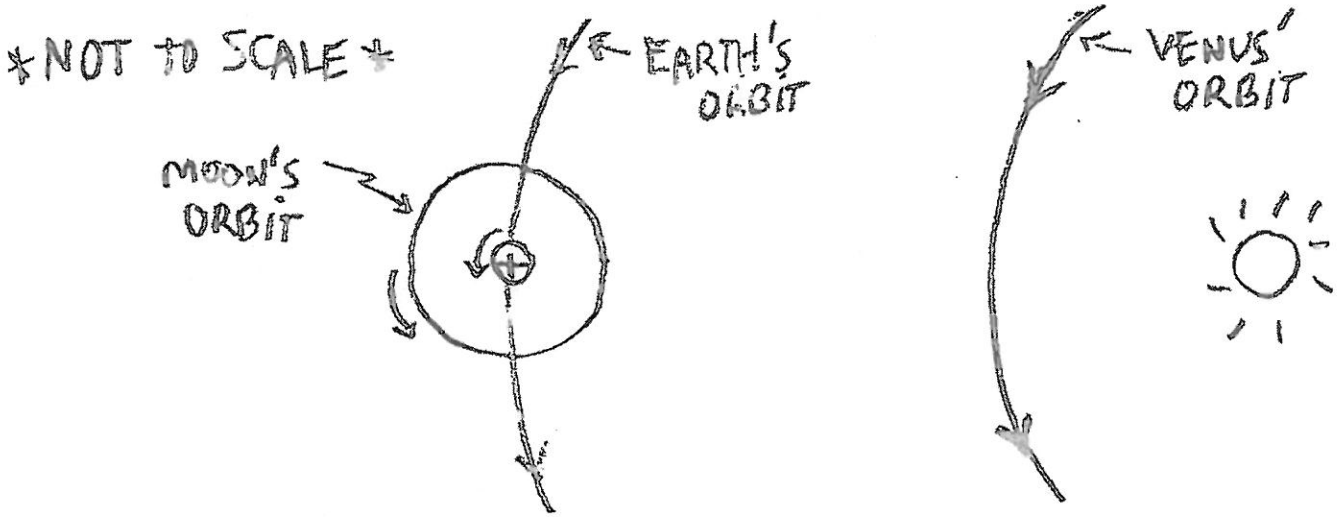
f). Does this heliacal rising of Venus in 1435 CE occur at the same day in the Tsol Kin sacred calendar round? Explain.

2. Below is a sketch of a conjunction of Venus and the crescent Moon that occurred just after sunset a few years ago just before Christmas. Two evenings later Venus was no longer visible in the evening sky.



a). Indicate on the sketch below the approximate location of the Moon in its orbit around the Earth at the time it was seen above.

b). Indicate with a capital "A" on the sketch below the approximate location of Venus in its orbit around the Sun, when it was as seen above.



c). Sketch the appearance that Venus would have had through a telescope (assume that the telescope image is NOT reversed) at that time. Use an arrow in your sketch to point towards the Sun.

d). Two evenings later Venus had disappeared from the evening sky. Where did it go? Where did Venus reappear in our sky? When would it next be visible? Explain

e). Locate Venus' position in its orbit on the sketch above, when it reappeared. Mark the location with a capital "B".

f). Interpret the disappearance and reappearance of Venus in the Mayan tradition.

3. (8 points extra credit) Since we all just survived the end of the Maya **Long Count Calendar**, while it is fresh in our minds, I am asking you to do a bit of Internet research about it. Right from the start, please note that just because you find something on the Internet, does not make it correct or accepted …and this is certainly true for a topic as "loaded" as the end of the Maya **Long Count**. Enjoy the adventure, but try to not take what you find out too seriously!

Along the journey, answer the following two, less-emotional questions:

a). (2 points) An important aspect of the Maya **Long Count** is how it correlates with the western Gregorian Calendar. This is sometimes called the "**Ahau Equation**" because it sets the Gregorian date of the start of the Maya **Long Count**, which also coincides with the **Tsol Kin** day 4 Ahau. The most accepted Maya-Gregorian Calendar Correlation is called the Goodman-Thompson-Martinez (GMT) Correlation. This is not the only such correlation. Other serious contenders include the Smiley Correlation. How do these two correlations (Smiley and GMT) differ?

b). (2 points) The **Ahau Equation** is usually expressed as:

Long Count (LC) date + **A** = **Julian day number (JDN),** where the JDN is a consecutive day number established to provide dates B.C.E. The important thing is that the JDN can be converted to a Gregorian or Julian calendar date using various websites, for example:
http://aa.usno.navy.mil/data/docs/JulianDate.php

For the GMT Correlation what is the date of the beginning (LC=0) and end (LC=1,872,000) of the Maya **Long Count Calendar**? That is, you need to find out what

A is for the GMT correlation and apply it to the **Ahau Equation.** For LC=0 be sure to specify whether your answer is in the Julian or Gregorian Calendar scheme. When does the Smiley Correlation place the end of the Maya **Long Count Calendar**?

c). (4 points) In the space below, report the most interesting thing you found out in your internet search about the end of the Maya **Long Count Calendar**? What is your opinion of this information?