

# Introduction to Astronomy

## HW20141002

due in two weeks

- (a) The diameter of the Sun is  $1.4 \times 10^{11}$  cm and the distance to the nearest star, Proxima Centauri, is 4.2 ly. Suppose you want to build an exact scale model of the Sun and Proxima Centauri, and you are using a ball 30 cm in diameter to represent the Sun. In your scale model, how far away would Proxima Centauri be from the Sun? Give your answer in kilometers. (b) A person with good vision can see details that subtend an angle of as small as 1 arcminute. If two dark lines on an eye chart are 2 mm apart, how far can such a person be from the chart and still be able to tell that there are two distinct lines? Give your answer in meters. (c) On April 18, 2006, the planet Venus was a distance of 0.869 AU from the Earth. The diameter of Venus is 12,194 km. What was the angular size of Venus as seen from Earth on that day? Give your answer in arcminutes.
- What is the sidereal time when the vernal equinox rises? On what date is the sidereal time nearly equal to the solar time? Explain your reasoning.
- Read the essay by James Randi “*Why Astrology Is Not Science*”, available on the course website. In 2-3 paragraphs, describe his points of view about astrology. In another paragraph, describe yours. Look on the web about “*The Million Dollar Challenge*” by the Randi Education Foundation. What is this challenge about, and briefly describe the results so far and a couple of cases that interest you.
- There are many night sky simulator software packages on the market, including the one included in your textbook. We mentioned *Stellarium* in the class, which is free of charge and has magnificent graphical interface. To download a copy, you can visit <http://www.stellarium.org/>, or if you need a Chinese enhancement kit, go to <http://timc.idv.tw/stellarium/>. Play around such a simulator of your preference. Find where Jupiter is lately. What are other bright stars near Jupiter? Print out a copy of the screen that shows those stars and Jupiter on 14 October 2013. What is the phase of the Moon that evening?
- Find out what the Alexandrian Library was. Around 200 BC, its librarian and director Eratosthenes devised a way to measure the circumference of the earth, to an admirable accuracy. Describe his method.
- Use the U. S. Naval Observatory website to find the times of sunset and sunrise on (a) your birthday and (b) the date this assignment is due. Are the times the same for the two dates? Explain why or why not.
- A satellite is said to be in a “geosynchronous” orbit if it appears always to remain over the exact same spot on the rotating Earth. (a) What is the period of this orbit? (b) At what distance from the center of the Earth must such a satellite be placed into orbit? (c) Explain why the orbit must be in the plane of the Earth equator.