ASTR120 Homework #1 – (Hamilton)
due Thursday Sept. 13 (20 Points)

Read Chapters 1 and 2 completely before starting these homework problems. Reading the book is one of the most important things that you can do in a college class.

These five problems are from Chapter 1.

20. Give the word or phrase that corresponds to the following standard abbreviations: (a) km, (b) cm, (c) s, (d) km/s, (e) mi/h, (f) m, (g) m/s, (h) h, (i) y, (j) g, (k) kg. Which of these are units of speed? (Hint: You may have to refer to a dictionary. All of these abbreviations should be part of your working vocabulary.)

23. What is the meaning of the letters R I V U X G that appear under some of the figures in this chapter? Why in each case is one of the letters highlighted? (Hint: See the Preface that precedes Chapter 1.)

27. The Sun's mass is 1.99×10^{30} kg, three-quarters of which is hydrogen. The mass of a hydrogen atom is 1.67×10^{-27} kg. How many hydrogen atoms does the Sun contain? Use powers-of-ten notation.

31. The star Altair is 5.15 pc from Earth. (a) What is the distance to Altair in kilometers? Use powers-of-ten notation. (b) How long does it take for light emanating from Altair to reach Earth? Give your answer in years. (Hint: You do not need to know the value of the speed of light.)

*37. Suppose your telescope can give you a clear view of objects and features that subtend angles of at least 2 arcsec. What is the diameter in kilometers of the smallest crater you can see on the Moon? (Hint: See the preceding question.)

These next four problems are from Chapter 2.

28. On November 1 at 8:30 p.m. you look toward the eastern horizon and see the bright star Bellatrix (shown in Figure 2.2b) rising. At approximately what time will Bellatrix rise one week later, on November 8?

31. Figure 2.6 shows the appearance of Polaris, the Little Dipper, and the Big Dipper at 11 p.m. (daylight savings time) on August 1. Sketch how these objects would appear on this same date at (a) 8 p.m. and (b) 2 a.m. Include the horizon in your sketches, and indicate the north direction.

38. The above image of Earth was made by the Galileo spacecraft while en route to Jupiter. South America is at the center of the image and Antarctica is at the bottom of the image. (a) In which month of the year was this image made? Explain your reasoning. (b) When this image

was made, was Earth relatively close to the Sun or relatively distant from the Sun? Explain your reasoning.

*53. How would the sidereal and solar days change (a) if Earth's rate of rotation increased, (b) if Earth's rate of rotation decreased, and (c) if Earth's rotation were retrograde (that is, if Earth rotated about its axis opposite to the direction in which it revolves about the Sun)?

This final problem is from the Web Exploration Problems link on the assignments page.

W15. Go to the Earth's Seasons website at http://janus.astro.umd.edu/astro/seasons. Run the defaults for College Park (latitude 39 degrees). a) How many hours of sunlight do we get in mid summer? Mid winter? b) How do these numbers change in Anchorage Alaska at latitude 60 degrees? c) What happens if you are on the equator? d) What is special about the Arctic Circle and the Tropic of Cancer? d) Under what conditions would Earth's Arctic Circle be south of its Tropic of Cancer? Does this happen on other planets (hint: click the help button)? Play with the simulation and have fun!

These additional tools may also be useful.

Need help with Scientific Notation? Try the tool at http://janus.astro.umd.edu/astro/scinote/ and practice until you can do this type of problem in your sleep! How about Ratios? Practice at http://janus.astro.umd.edu/astro/equations/.