AST 301 Homework #1 Due Friday Sep. 5

1. In class our scale model of the Universe was measured in feet and miles. Convert the numbers below from feet to meters (m), from miles to kilometers (km), and from parsecs (pc) to light years (ly). You can approximate 1 m = 40 in, 1 km = 5/8 mi. Look up the size of a parsec and a light year in your book.

Sun: 100 ft. diameter (in our scale model) 100 ft. = 1200 in. = 30 m. Earth: 1 ft. diameter, 2 mi. from Sun 1 ft. = 12 in. = 0.3m, 2 mi. = 2 / 5/8 = 3.2 km Jupiter: 10 ft. diameter, 10 mi. from Sun 10 ft. = 3 m, 10 mi = 16 km α Cen: 1.33 pc from Sun (actual distance) 1 pc = 3.086×10^{13} km and 1 ly = 9.46×10^{12} km, so 1 pc = 3.086×10^{13} / 9.46×10^{12} = 3.26 ly 1.33 pc = 4.34 ly Andromeda galaxy: 800,000 pc from Sun (actual distance) 800,000 pc x 3.26 ly/pc = 2.6×10^6 ly

Also, give the actual size and distance to each of these objects in meters or kilometers, expressing your answer both as an ordinary number and with powers of ten notation. You can look up the sizes and distances in your book or scale from the numbers from class, using the fact that the actual distance of the earth from the Sun is 150,000,000 km $(1.5 \times 10^8 \text{ km} = 1 \text{ AU})$.

2. Austin is at a latitude of about 30° north of the equator.

Describe the location of Polaris in the sky as seen from Austin. What direction would you face to see it, and how far above the horizon would it be? You would face north. It would be 30° above the north horizon.

Polaris doesn't change its location in the sky during a night. Why is this? The celestial sphere rotates around Polaris. Polaris is at the pivot point. So it doesn't move.

Orion's belt is near the celestial equator. Where on the horizon is it when it is rising? Describe its location in the sky (in Austin) 6 hours after it rises. (Hint: it is not directly overhead. How far from overhead is it?)

You look due east to watch Orion rise. Six hours later it is at its highest point in the sky, which is about 30° south of overhead since the celestial equator is 90° from Polaris.