Astr 1010
Problem Set #3
[Study; not to be turned in!]

1. Consider an observer who lives at 52° North latitude (e.g. Saskatoon, SK). At noon, what angle does the sun make with the southern horizon on:

a) Sept 21

b) Dec 21

c) Mar 21

d) June 21

2. Consider an observer at the South Pole. Does the motion of the stars in the night sky differ from what an observer sees at the North Pole? (Use, or *imagine* the celestial sphere model.) If so, in what way?

3. What is the *angular width* of a crater on the Moon which is 5.0 km in diameter?

4. Verify that if a 25-cent piece is observed at the length of a football field, its angular width is about 1 minute.

5. On the average, when we see the planet Mars it is at a distance of about 1.5×10^{11} m from the Earth. At such a distance, how long does it take a radio signal to reach us from Mars?

The average bright stars in your average constellation are about 100 ly from the Earth. How does this distance compare with the (average) distance to Mars? Find the ratio

$$\frac{d_{\text{const}}}{d_{\text{Mars}}}$$

(Use the fact that $1\,\text{ly} = 9.46 \times 10^{15}\,\text{m}$.)

If in a certain scale model of the universe we put Mars 3 ft away from the Earth, where would we put the stars in an "average constellation"? To find this number we make the corresponding ratios equal:

$$\frac{x}{3\,\text{ft}} = \frac{d_{\text{const}}}{d_{\text{Mars}}}$$

and solve for x.

Express x in feet and in miles. Think about this result the next time you are told that "Mars is in Scorpio"!