For Problems 1 and 2, you will need to use a celestial sphere. There is one in 3260 BMPS.

1. **Motion of the Brightest Stars**. (10 pts.) The 16 brightest stars that are visible from the northern hemisphere are Sirius, Arcturus, Vega, Capella, Procyon, Rigel, Betelgeuse, Altair, Aldebaran, Spica, Antares, Pollux, Fomalhaut, Deneb, Regulus, and Castor. Choose one of them, and find (1) (1 pt.) the coordinates of the star, (2) (2 pts.) the date on which it is visible on the meridian at sunset, and (3) (2 pts.) the date on which it is rising at sunset. The meridian is the great circle line that passes through the celestial pole and the zenith. Give the declination in degrees and the right ascension in hours and minutes. (4 pts.) Explain how you found the dates. For simplicity, assume that you are on the equator.

2. The coordinates of the center of the Milky Way galaxy are $17^{hr}39^{min}$ right ascension and $-29°$ declination.

   a. (5 pts.) When is the best time of year to observe it? Explain how you can figure this out from knowing that the right ascension of the sun is $0^{hr}0^{min}$ on the vernal equinox.

   b. (2 pts.) Is it better to observe it from Michigan or from Chile in South America? Explain your reasoning.

3. **A mental model of the sky,** which we introduced in class.

   a. (5 pts.) A star rises at 8 pm. When does it rise two months from now? Explain how you deduced the answer.

   b. (5 pts.) Which constellation of the Zodiac is high in the sky at sunset tonight? Explain how you deduced the answer.

Sag

Cap   Sco

Aqu   Lib

7/21 6/21 5/21

8/21   4/21

Pis   9/21   Sun   3/21   Vir

10/21   2/21

11/21 12/21 1/21

Earth's orbit

Ari   Leo

Tau   Can

Gem