Physics 174 26 January, 2007
Exercise 3 — Due 19 February, 2007

Name: _____

The Winter Skies

Table: _____

Step 1. Calibrate your hand.

In this exercise, you will estimate the altitude of stars above the horizon, using your hand to measure angles. So the first thing to do is to figure out how many degrees across your hand is. Stand directly between two objects (the two sides of a wide door, two trees, two goalposts, etc.), so that they are 180° apart. Make a fist with your hand, with your thumb covering the top of your fist, and extend it to arm's length. Then sight down your arm with one eye. To determine how many degrees of angle your hand takes up, count how many hand widths it takes to cover 180° of angle. Keep moving your hand one width to the left or right at a time, using background objects as reference points to keep track.

_____ handwidths = H = 180°.

The quantity 180°/H = the angular width of your hand = _____.

It's OK to round to the nearest degree. The answer will be about 10° for most people.

Step 2. Study a star chart.

Your textbook has a nice set of starcharts in Appendix B. From the warm cozy comfort of your own room, have a look at the chart for February and try to get a feel for where the different constellations will be in the sky before you actually step out into the cold night air. If a star is in the center of the circle (like Capella), that means that it will be close to the zenith if you observe at 8 pm (i.e. its altitude is 90°). A star halfway from the center to one side of the circle is 45° above that direction on the horizon.

Step 3. Measure the altitude and azimuth of 10 bright stars and planets.

Your task is to measure the altitude and azimuth of the ten objects listed in the table on the next page. To do this, you will need to find a dark location with a good view of the horizon. Don't forget to dress **warmly** (i.e. really warmly). It's a good idea to bring a flashlight and your starcharts, since it takes a little practice to find your way around the night sky.

As many of you are well aware, Ithaca is not famous for its clear skies, especially in the winter, so don't pass up the first good night you get. It might be the only clear night before the assignment is due.

If you are planning to observe later than 9 pm, you will need to use one of the later

starcharts. For every two hours later you are observing, use the star chart for one month later. For example, if you make your observations in early February, but at 1 am, use the chart for early May at 7 pm (six hours difference = three months).

Record the date and time of your observation:

Date: _____ Time: _____

For each object in the table below, record its altitude and azimuth. The definitions below might help you. As a bonus, see if you can detect a color difference between Betelgeuse and Rigel, and between Castor and Pollux.

Altitude — the angular distance of an object above the horizon directly beneath it. Record this measurement in degrees from the horizon to the object. Realistically, you will only be able to estimate the altitude to the nearest five degrees.

Azimuth — the direction of the horizon directly beneath an object. Record your answers as "NE", "E", "SE", etc. If an object is at the zenith (altitude=90°), then it doesn't really have an azimuth.

The values for Polaris are already filled in.

Target	**Altitude**	**Azimuth**	**Color**
Polaris (α UMi)	42°	N	
Capella (α Aur)			
Aldebaran (α Tau)			
Betelgeuse (α Ori)			
Rigel (β Ori)			
Sirius (α CMa)			
Pollux (α Gem)			
Castor (β Gem)			
Regulus (α Leo)			
Saturn			

Hint: Saturn is the bright "star" somewhere near Leo that's not on your starchart.