Physics 174 26 January, 2007
Exercise 4 — Due 19 February, 2007

Name: _____

The Circumpolar Stars

Table: _____

Step 1. Make a drawing of the north circumpolar stars.

Find a dark site with a good view of the northern horizon. The parking lots toward Ithaca from Emerson Hall are one good location. As usual, **dress warmly** and bring a flashlight. You will also want to bring a ruler. You should make your drawing on a blank piece of 8 1/2 × 11" typing paper.

Record the date and time of your observation.

Date: _____ Time: _____

The best way to make your drawing is to use a ruler, held at arm's length, to measure the distance between the stars, the horizon, and landmarks on the horizon. Make sure that your drawing will fit on a page by scaling it (by 1/4 or 1/5 or so). You might choose, for example, to scale it so that an angle equal to 4" on your ruler is a distance of 1" on your page. Start by sketching in the horizon, then add the stars. Your drawing should include the horizon, the Big Dipper, the Little Dipper, and Cassiopeia, among any other bright stars visible. You should not include fainter stars.

Identify Polaris, the North Star, on your drawing. It's at the end of the handle of the Little Dipper. If you've never done this before, you can use the two stars in the dipper of the Big Dipper on the opposite side from the handle as pointers to Polaris. The star charts in Appendix B of your textbook show you how to do this. Make a careful note of the horizon underneath Polaris.

Step 2. Repeat step 2 after about two hours have passed.

Try to stand in exactly the same place. If it clouds up, you can try again after another hour or two. If that doesn't work, it may take more than one night to complete this assignment. If a week or more passes between Steps 1 and 2, you will need to start entirely over.

Again, record the date and time of your observation.

Date: _____ Time: _____

Make your drawing on the ***same page***, but use a different color of ink.

Has Polaris moved?

(Hint: That's really the whole point of this exercise, to demonstrate to you how the skies rotate about the North Celestial Pole!)

Step 3. Estimate how many degrees the sky rotates each hour.

Pick out a few different stars in Cassiopeia and the Big Dipper and measure how much they have rotated around the North Celestial Pole. That is, measure the angle from a star in Step 1 to the NCP and back to the same star, but in Step 2. Use a protractor. Each star will give you a separate angle. Be sure to draw these angles (lightly in pencil) on your drawing.

Star	Angle (°)	(Use this space if you measure more angles.)
1	_____	
2	_____	
3	_____	
4	_____	
5	_____	

What is the average of these measurements? _____°

How much time has passed between Steps 1 and 2? _____ hours

What is your measured rotation rate for the sky? _____ °/hour

Let's see how close you've come to the actual rate of rotation.

How many degrees does the sky rotate in one day? _____°

How many hours are there in one day? _____ hours

What's the actual rotation rate? _____ °/hour