

**This is your first assignment using the *Starry Night* software.****This is due in class by Tuesday, February 24<sup>th</sup>.**

You may turn this in any time prior to the due date. Homework is due at the start of class. **Late homework is not accepted!** If you will be unable to make it to class to turn this in, you may turn it in to me during office hours. **It will not be accepted if turned in at the mailboxes in the administration building!**

The assignment cannot be done on the internet. The software is located on the computers in room 34-108 on the other side of the courtyard. Hours when the computers are available will be posted on my website. The room may be open at other times, but there is no guarantee. If you wish, you may purchase a time-limited, reduced price version of the software. See my web page for instructions.

**You must log in on our computers using the username and password assigned to you by the college. The username is usually *firstname.lastname* and the password is usually your birthday in the format *mmddy*.**

To begin the software, click on the *Starry Night* icon on the desktop. If there is no icon, look in the list of programs for *Starry Night College*. Don't check for updates. When the program starts (it takes a while), close the daily hint that is the first thing shown. To begin the assignment, open the **SkyGuide** pane. This is opened by clicking on a very small tab about half way down on the left side of the screen. Then click on "Student Exercises" and begin the required assignment. Once the assignment begins, follow along with the instructions. You should work through all the *computer* exercises (ignoring things like writing short stories), but only answer the specified questions on this sheet. **Note: Many of the questions may be changed from those given in the software; there also may be additional questions or instructions on the homework sheet that are not listed in the software. Follow along on this printed homework assignment and also read the information given in the software exercise.**

**To answer most of the questions, you should think about what you are shown, rather than try to look up information.**

**You might be able to figure out many of the answers from outside source. Do not do that; figure out the answers yourself as you work through the software.**

**Remember, although you may discuss these exercises with other students, the work you hand in should be your own. Students who turn in answers which are substantially the same as those of other students will receive between 0 and 50% of the points they would otherwise score.**

**There is a tutorial you may wish to do first, but it is not required.**

## **Lesson A5: The Celestial Sphere**

Open the **SkyGuide** pane, and navigate to  
**Student Exercises > A – Earth, Moon, and Sun**  
**> A5: The Celestial Sphere**

and follow the instructions given. Record your answers to the questions in the spaces provided.

**Question 1a: Go to 1: The celestial equator.** Click where shown in the text area on the left side of the screen to view the celestial equator. Also, click anywhere in the main window and press “k” on your keyboard to toggle the constellations on/off.

Name two constellations on the celestial equator. Hint: if you wish to move the sky to view different portions, use the “hand” cursor by left-clicking and dragging the sky around. To change the cursor, click on the down arrow (▼) just to the right of the cursor control in the upper left portion of the screen and select “hand.”

**Question 1b:** Name one constellation north of the celestial equator. Hint: unless you have flipped the Earth upside down, this will be above the celestial equator on the screen.

**Question 1c:** Name one constellation south of the celestial equator. Hint: unless you have flipped the Earth upside down, this will be below the celestial equator on the screen.

**Question 2a: Go to 2: The celestial poles.** The relatively bright star near the north celestial pole is Polaris. What else is Polaris called (the answer is not “north celestial pole”)? (Remember to click in the text area to make the pole indicators visible and then to find both celestial poles by dragging the sky with the hand tool.)

**Question 2b:** Is there a bright star near the south celestial pole that would serve as a “South Star”? Explain.

**Question 3a: Go to 3: Finding the North Celestial Pole.** This takes you to Toronto, Canada. An observer looking toward Polaris is always facing in what direction?

**Question 3b:** In the view menu, set "Hide Daylight" to turn off daylight. Speed up the rate at which time flows so that you can see the stars move. To do this, click on the down arrow (▼) just to the right of "Time flow rate" (near the top center of the screen) and select 3000X. Use the nearby right arrow (▶) to "run time forward" and the box (■) to pause. Watch the celestial sphere turn for 24 hours.

Describe the motions of (1) the north celestial pole, (2) Polaris, and (3) the other stars in the field.

**Question 3c:** Set your location to Anchorage Alaska. To change your location, click on the down arrow (▼) just to the right of "viewing location" (near the top center of the screen), click on "other" and select Anchorage from the list. What is different about the position of Polaris and the north celestial pole in the sky compared to Toronto?

**Question 3d:** Find the Big Dipper (from Anchorage). Hint: hit "k" to turn on the constellation names. The Big Dipper consists of the brightest stars in the constellation of Ursa Major. (1) What is its motion in the sky? (2) Does it ever set? To see, hit "run time forward" to advance time and use the "hand" cursor to see more sky "above" the pole on the screen.

**Question 4a: Go to 4: North celestial pole and an observer's latitude.** Set the cursor to the angular separation tool. To do this, click on the down arrow (▼) just to the right of the cursor control in the upper left portion of the screen and select "angular separation". In this screen, the sky appears as from New York City, with latitude of the approximately  $41^\circ$ .

Measure the angle of Polaris above the horizon. To measure the angle, click on Polaris and drag the cursor to the horizon (near the letter N); ignore the fake hills. Note, you can only get an approximate answer (actually, I get an answer that is a little bit wrong!). Also, do not read the angle from "gaze"; that is incorrect. You should record the "angular separation" not position angle or distance.

**Question 4b:** Click on the command in the text area to change your position to Key West FL, at approximate latitude of  $25^\circ$ . Measure the approximate angle of Polaris above the horizon?

**Question 4c:** Change your position to Anchorage, at a latitude of approximately  $61^\circ$ . Measure the approximate angle of Polaris above the horizon?

**Question 4d:** What is a general rule for how the angle above the horizon of the north celestial pole relates to the observer's geographical latitude on the surface of the Earth? (Remember, you can't measure these angles exactly).

**Question 4e:** Imagine you traveled to the Earth's north pole, at a latitude of  $+90^\circ$ . How far above the horizon would the north celestial pole be? Where would you look to find the pole in the sky?

**Question 5: Go to 5: the ecliptic.** Use the right arrow (▶) to “run time forward” and the box (■) to pause. Let time run forward for at least a month. What are the two bright objects moving just in front of or behind the Sun (pause to identify them with the cursor).

**Question 6: Go to 7: The equinoxes.** The location in the sky where the Sun crosses the celestial equator from south to north is called the Vernal equinox. Let time run forward. On what date does the Sun's position coincide with the Vernal equinox?

**Question 7: Go to 8: The solstices.** The most northerly position of the Sun (when it is highest above the equator) is called the summer solstice. Let time run forward. You may need the “hand” cursor to find the solstice. On what date does the Sun reach the summer solstice?

**Question 8:** Measure the maximum angular distance from the celestial equator that the Sun can reach (at the summer solstice)? Use the angular separation tool. Again, you should record the “angular separation” not position angle or distance.