

**This is an extra credit assignment using the *Starry Night* software.**

**This is due by the final. It must be turned in during class or in my office prior to the final. It may also be turned in to me at the very start of the final exam.**

**Assignments turned in to my mailbox in the administration area will NOT be accepted.**

**Assignments turned in after the start of the final will NOT be accepted.**

<p><b>It is very unlikely the computer room will be available during finals week. However, if it is open, times will be posted on my website.</b></p>
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**The score for this exercise will be added to the final. Grading for this exercise may be somewhat less detailed than for previous *Starry Night* exercises. However, you should realize that extra credit is just that, extra. Work that is sloppy, poorly done, or shows clear evidence of copying (such as identical or nearly identical answers from more than one student) will not receive partial credit. It will receive zero credit.**

## **Lesson G1: Our Home Galaxy, the Milky Way**

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Open the **SkyGuide** pane, and navigate to

**Student Exercises > G: Galaxies and the Universe**

**>G1: Our Home Galaxy, the Milky Way Galaxy**

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

**Question 0: (Go to 1: The structure of the Milky Way) Stop the motion.** Then use the location scroller to examine the Milky Way Galaxy from various angles. In your own words, describe the Milky Way based on what is shown in this exercise. Note: the grid that is included in the image is meant to be flat, although it may look curved on the screen.

Spring 2015

**Question 1: (Go to 2: The solar system in the Galaxy)** Describe the location of the Sun and solar system within the Milky Way.

**Question 2a:** Use the angular separation tool to measure the distance from the center of the Milky Way to the Sun. How far is it in light years?

**Question 2b:** Convert the distance in (2a) into kilometers (km) by multiplying by 9.46 trillion km/light year ( $9.46 \times 10^{12}$ ). Show your work (that means write out the problem as you typed it into your calculator; don't write out a long multiplication.)

**Question 2c:** Convert the distance in (2a) into kilo parsecs (remember, one pc is 3.26 light years, so there are fewer parsecs than there are light years and fewer kiloparsecs than there are parsecs. What is "kilo"?). Show your work.

Spring 2015

**Question 3a:** The Sun is moving with a velocity of about 220 km/sec in its orbit about the galactic center. Using your answer from Question 2b (the distance of the Sun from the center of the Galaxy in km), what is the approximate time required for the Sun (and the entire solar system) to complete one orbit of the galactic center? First find the distance the Sun must go around the Galaxy by multiplying the distance from the center by  $2\pi$  (which is 6.28). Then, divide the distance travelled by the speed. Finally, convert the time to years by dividing by 31557600 seconds/year. Show each of these three calculations.

**Question 3b** Approximately how many times will the Sun orbit the galaxy during its time on the main sequence? Show your calculation.

Spring 2015

**Question 4 (Go to 3: The view from Earth):** Why does Milky Way appear as an irregular band of diffuse light rather than distinct stars?

**Question 5:** The Solar System is embedded within the galaxy. Why does the Milky Way appear as a narrow band of light instead of appearing as faint but evenly distributed light across the entire sky?

**Question 6a: (Go to 4: The Galactic plane and the ecliptic)** How does the plane of the solar system compare to the plane of the galaxy?

**Question 6b:** Based on your answer to 6a, do you think the orientation of the plane of the solar system in the Galaxy is related to the shape or orientation of the Galaxy as a whole?

**Question 9a: (Go to 7: Galactic object distribution).** Follow the instructions given in the program on how to display different types of objects. Briefly, these are: open the options pane and expand the "Deep Space Objects" group by clicking on the "+". Within the "Deep Space" group, put a check in the NGC-IC database and expand that group. This is a rather old catalog including the brightest examples of a variety of objects. Within that group, display the open clusters (galactic clusters) of the Milky Way by putting a check in the appropriate box. Describe how they are distributed within the Galaxy.

**Question 9b:** Turn off (uncheck) the open clusters. Display the planetary nebulae of the Milky Way. Describe how they are distributed within the Galaxy.

**Question 9c:** Turn off (uncheck) the planetary nebulae. Display the globular clusters of the Milky Way. Describe how they are distributed within the Galaxy.

**Question 9d:** Turn off (uncheck) the globular clusters. Display the NGC galaxies ("galaxy") which are bright galaxies near the Milky Way. Describe how they are distributed with respect to the Galaxy. Why do they seem to avoid an area of this chart?