

Homework 10

Please write all your work and answers on separate paper. (You can turn in this page with the questions or not, as you wish). Show all your work on calculations and explain your reasoning whenever you can.

1. **The Water Hole:** Explain the meaning of the “water hole.”
2. **History of the Hidden:** Even though the band of the Milky Way was clearly visible in the night sky to ancient observers, figuring out the shape and structure of our galaxy proved to be quite difficult.
 - a. Why was it difficult to deduce the correct shape and structure of the galaxy?
 - b. What technological development(s) made it possible to figure out the shape and structure of the Milky Way? (Hint: Figure 6.29 might be helpful.)
3. **Galactic orbit:** The Sun completes one orbit around the Milky Way in about 230 Million years. The sun is expected to remain on the Main Sequence as a G2 star for another 6 Billion years (6×10^9 years = 6 Gyr). How many orbits will the Sun complete in that time (assuming nothing else disrupts the Sun’s motion in the intervening time)?
4. **Planetary Wheel?** Figure 22.30 shows that the Milky Way has a flat rotation curve. Explain how that rules out both wheel-like and planet-like rotation of the galaxy.
5. **Black Hole, Dark Matter?** What percentage of the mass of the Milky Way (dark matter included) is made up by the black hole at the center of the galaxy?