ASTR1050
Fall 2025

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Due Date: 14 November, 11:59 PM

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1. **Suppose you are traveling to Alpha Centauri, a nearby star at a proper (rest-frame) distance of 4.25 light years away at 95 % the speed of light. What distance do you measure to Alpha Centauri on the rocket ship?**
2. **Traveling on the same rocket ship, you celebrate your birthday after a year of travel. How much time has passed on Earth?**
3. **List two of the several proofs of GR discussed in class, and how they support GR.**
4. **Suppose the stars in an elliptical galaxy all formed a few million years after the universe began. Suppose stars spanning a range of masses form initially, just as in our own Galaxy. How would the color of the elliptical change over the next several billion years? How would its luminosity change?**
5. **The Pinwheel Galaxy has an angular size of 40.1 arcseconds and is a distance 21.6 megalightyears away. How big is the Pinwheel galaxy?**
6. **Why was Hubble's estimate of the distance to M31 about half of the modern value?**
7. **The Whirlpool galaxy has apparent magnitude 8.4 mags and is 7.22 megaparsecs away. What is its absolute magnitude?**
8. **How many times brighter than the Sun is the Whirlpool galaxy? The Sun has absolute magnitude $M = 4.83$ mags.**
9. **How do spiral and barred spiral galaxies differ?**
10. **What is the Winding Problem, and how was it resolved?**