

ASTR/PHYS 2500 Final Exam Study Guide

Comprehensive, but focused on Chapters 19 and above that we covered

Midterms 1 & 2 Material (most important concepts)

Milky Way

- Why is it hard to study what's in our own Galaxy?
- What are the individual components of the Milky Way, and what are their physical scales?
- Where do the stars in the MW halo come from?
- What do you have to measure about a star to figure out its 3D motion in space?
 - How do you measure those quantities?
- How can we use the rotational speed of stars in the MW to infer the MW's mass?
 - What does this measurement tell us about the amount of mass in the MW compared to its expected mass?
- What do we know about the nature of dark matter?

Supermassive BHs and Active Galaxies

- How do we know there's a BH (as opposed to something else that's massive) in the center of the MW?
- How massive are SMBHs? How do their Schwarzschild radii compare to their ripping radii?
- What does it mean for a galaxy to be called "active"?
- What is the structure of an Active Galactic Nucleus (AGN)?
- How can AGN be so bright that they outshine billions of stars?
- What is the Eddington luminosity of a SMBH (or any other accreting object)?

Galaxies

- What observation settled the debate about what the "spiral nebulae" were?
- How do we classify galaxies?
- What properties differentiate elliptical and disk type galaxies?
- What dominates the light from a galaxy at different frequencies?
- What is the distance ladder?
 - How does it allow us to estimate distances to the most far away objects?
 - What distance measures make up its rungs?
- What is Hubble's law, and what does it imply about the universe?
- How are galaxies distributed in the universe?

Cosmology

- What is the universe made up of, and in what proportions?
- Why is the night sky dark?
- How is the Hubble parameter related to the Hubble constant?
- What does the Friedmann equation describe, and what does it depend on?
- What are the different models for how our universe expands?
 - Which universe do we think our is?
 - What observations indicate this?
 - What is dark energy?
- What is the cosmic microwave background (CMB)?
 - What is recombination, and why does it limit how far back in lookback time we can directly observe the universe?
 - What are the tiny temperature fluctuations in the CMB?
- If our current understanding of cosmology is correct, what is the ultimate fate of the universe?