Black Holes in Galactic Centers – Joel D. (text 16.6, 19.6)

1) Why is a central Black Hole at the Center still technically only theory even though commonly accepted?

2) What evidence both from the Milky Way and other galaxies gives evidence of a small, single, super-massive object?

3) How fast would a star in a circular orbit with a radius similar to Earth's radius from the sun's (1.496 x 10^13 cm) rotate around the MW's central object (M=3.7x10^6 Suns)? (Show your work.)

Quasars – Callista (text 19.4, 19.6)

1. If the period light variation of a quasar is 24 days, what is its maximum size?

2. How are the jets of a quasar formed?

3. What is a quasar?

Gamma Ray Bursts – Jeff (not in text)

Not received

Star Clusters - Micah Borcherding (text, chapter 13)

1. Describe what is meant by dynamical relaxation.

2. What can be learned about the evolution of the galaxy from the study of star clusters?

3. Find the relaxation time of a cluster of 10^6 stars, each of mass 0.5 Msun and with a cluster core radius of 5 pc.

\[ T(\text{rel}) = NR/v \]
\[ v(\text{rms}) = \left[ \frac{3}{5} GM/R \right]^{1/2} \]

Europa: Surface and Internal Structure – Matthew (text 25.5)

1. What is the cause of the heating of Europa?

2. The heat flux form Europa’s seafloor is 8.7 trillion watts; for comparison the flux from the Earth’s seafloor is 32 trillion watts. Compare the flux at both seafloors in W/m^2. (R(Earth)=6378 km; R(Europa)=1570 km)

3. What do we learn about Europa from the fact that it does not have many craters?
The Hunt for Earth-Like Planets - Tami (text 27.5)

1. What is one characteristic (beyond having comparable mass) that is necessary for a planet to be labeled “Earth-Like”?

2. Name or describe a way in which extrasolar planets are detected or a proposed method for detecting them.

3. Consider the following:

Using a star’s spectrum, we have determined that the planet orbiting this star has a lower mass limit of $8M_{\text{Earth}}$. Given the following form of the mass function for a planet orbiting a star whose mass is much larger than that of the planet, what is the mass of the planet if the planet’s orbit is inclined at 30º to your line of sight from the Earth?

\[ M_p^3 \sin^3 i = \frac{(P^2 k^3 M_*)}{(2\pi G)} \]

Obler’s Paradox – Ansel (text 20.2.1)

1. Describe Obler’s paradox

2. List two proposed solutions to Obler’s paradox.

3. Suppose that magical interstellar dust that does not obey the laws of physics exists in intergalactic space; this dust absorbs light but only re-emits half of the light absorbed. Show how this would resolve the paradox.

The Large-Scale Structure of the Universe - Tom (text 18.4-5)

1. What sort of distribution structure do we see when we plot galaxies at the largest scales?

2. What caused this structure to develop?

3. What attribute do we see in the Cosmic Microwave Background Radiation that provides evidence to support this?

An Accelerating Universe – Jason (not in text)

1. If the absolute visual magnitude of a typical type Ia supernova is −19.5 and the observed visual magnitude of the of one of these is 22.7, what is the approximate distance to this supernova?

2. Aside from acceleration, what are two other explanations for the observed brightness of the most distant type Ia supernovae? Are these explanations valid?

3. Of what does an accelerating universe suggest the existence?