

## Astronomy

### Galaxies

- There is dust that prevents us from seeing near the galactic plane
- All types of galaxies
- Elliptical- just an elliptical shaped galaxy
- Spiral- the distribution of stars follow spiral arms
- Bar spiral- the stars emanate from the ends of the bars
- An ellipsoid is when you take an ellipse and rotate it 360 degrees – the stars move at all kinds of speeds and in all directions
- Elliptical galaxies are very dense and the stars are on very specific orbits (they are not random)
- Find the perimeter from knowledge of the distance from the galactic center
- You can have different perceptions of the same object
- Irregular galaxies
- The reason for irregularities is because there is cannibalism between galaxies
- Two galactic centers in Andromeda
- Orbital speed around the galactic center is the same
- Dark matter is the hand that helps the stars go around the galaxy at the same speed
- Many stars packed together at the center of the galaxy

### Video

- Quasars look like stars but they are highly compact galaxies
- They outshine normal galaxies
- Radiowaves form a map that are invisible to normal telescopes
- Quasars produce their energy at a tiny region at their core
- Giant black holes may be at the center of galaxies
- The gas is squeezed at the center of the galaxies
- The black holes can grow to the size of the solar system
- The VLBI is a form of a very large telescope from a bunch of countries
- Some of the material is shot out of the black hole
- No causal relationship
- The event horizon is where the escape velocity is equal to the speed of light
- Material coming out of the black hole is an illusion
- The jets are because of the huge magnetic field from the particles going around the black hole
- This material is not coming out of the black hole
- Galaxies come in clusters
- Hubble's law
- Hubble discovered galaxies
- The farther away objects are, the faster the objects move away from us- This is Hubble's law
- The slope is 70
- Every Mpc you move away from us, add 70 km/s to your speed
- The center of the universe is not in our universe
- We live in three dimensions