1 6/4/2025 lecture

1.1 Exoplanets

The term "exoplanet" is a portmanteau for "extrasolar planet". Once you identify a star, there a few techniques you can use to detect a planet orbiting it.

One method is the transit method, where we observe the luminosity of a star dimming temporarily at regular intervals. This is difficult because planets are usually a lot smaller than their host planets (so the dimming is relatively small), they might not orbit in a plane that we are on, and a star's luminosity fluctuates anyways. However, this can tell us the period of an exoplanet's orbit and the radius of that exoplanet.

More exoplanets have been detected by the transit method than by any other method.

Another technique is the Doppler method, which tells us the eccentricity and period. If there is a sufficiently massive exoplanet orbiting sufficiently close to the star, the star will orbit the center of mass and we can measure how fast that star is moving towards or away from us by observing the Doppler shift of its spectral lines.

The mass calculated using the Doppler method is always a lower limit, because we assume we are in the exoplanet's orbital plane.