

SCI 238 Midterm Review (Chpt. 1–11)

The Sky

- **Celestial sphere:** coordinates and positions are relative to Earth's surface and rotation
 - **Celestial equator** = Earth's equator mapped to the sky
 - **Celestial poles** = Earth's poles
 - **Right ascension** = longitude lines, measured w.r.t. vernal equinox
 - **Declination** = latitude lines, measured w.r.t. celestial equator
- **Ecliptic** = plane of Earth's revolution around the sun
- **Vernal equinox** = point where the sun (ecliptic) crosses the celestial equator from south to north
- **Meridian** = latitudinal line directly above a given point on the surface of Earth
 - **Solar noon** = when the sun is along the meridian at the current location
 - a.k.a. 12:00 **apparent solar time**
- **Zenith** = directly overhead
 - Sun is at the zenith when observed at the equator, during equinoxes
 - Sun is at the zenith when observed at Tropic of Cancer/Capricorn, during solstices

Kepler's Laws

- First Law: if a = semi-major axis, e = eccentricity then
 - Perihelion distance = $a(1 - e)$
 - Aphelion distance = $a(1 + e)$
- Second Law: planets' revolution around the sun cover the same area in equal time
- Third Law: $(\text{orbital period})^2 = (\text{semi-major axis})^3$
 - $P^2[\text{years}] = a^3[AU]$
- Newton's version of the Third Law:

$$p^2 = \frac{4\pi^2}{G(M_1 + M_2)} a^3$$

- Usually used to find mass of main body, given orbital period and orbiting distance of orbiting body
- Distances from 2 bodies to their common centre of mass (another Newton extension) = $m_1 a_1 = m_2 a_2$