Astronomy 1F03: Assignment 1

Due Date: Tuesday 4th Oct, 2016; hand in to ABB241 by 2pm (10% per day late penalty)

Write your answers on a separate sheet showing your working and explaining any formulae you use

1. A comet orbiting the Sun has a perihelion distance of 1AU and an aphelion distance of 71AU. Calculate the semi major axis and eccentricity of the orbit. How long does it take to travel from aphelion to perihelion?

2. Consider objects in orbit around the Earth.

   a. Do these objects obey the standard form of Kepler's laws? If not, which law(s) differ and why?

   b. Using your conclusions from part a) and that the radius of the Moon's orbit is 60 times the radius of the Earth and its period is about 27 days, calculate the period of a satellite in low Earth orbit (that is, in an orbit of about 1 Earth radius).

3. A star is 20 parsecs away. What parallax angle do we measure from Earth? What parallax angle would we measure if we lived on Jupiter?

4. Starting from Newton's law of gravitation, $F = G\, m_1\, m_2\, /\, r^2$, calculate the ratio of the weight of an astronaut on Ceres to her weight on Earth. Ceres has a radius of 0.073 Earth radii and a mass of 0.00015 Earth masses.

5. The resolving power of the human eye is about 2' (two arc minutes). What diameter must a radio telescope have in order to achieve the same resolving power if observing at a wavelength of 21cm?

6. The Sun's rotation period is 25 days at the equator. Given that the radius of the Sun is 700,000 km, calculate the maximum velocity of approach or recession of the Sun's equator as viewed from Earth. Find the maximum change in wavelength of a spectral line due to the rotation and express it as a percentage of the rest wavelength of the line.