- For a spacecraft trajectory around the earth, r = 10,000 km when the true anomaly is 30°, and r = 30,000 km when the true anomaly is 105°. Calculate the eccentricity. [≈ 1.22]

- At a given instant, a spacecraft has the position and velocity vectors r_0 = 7000 î (km) and v_0 = 7 î + 7 ĵ (km/s) relative to an earth-centered non-rotating frame. {\mu = 3,98,600 km^3/s^2}
  (a) What is the true anomaly of the initial point? [≈ 99.208°]
  (b) What is the position vector after the true anomaly increases by 90°?
     [≈ 43183 ĵ (km)]

- For a hyperbolic orbit, find the eccentricity in terms of the radius at periapsis r_p, the hyperbolic excess speed, and mu. [e = 1 + $r_p\, v_\infty^2/\mu$]

- Let F be the center of the circle of radius 2a. Consider a point F' located inside the circle such that the distance FF' = 2ae, where e < 1. Join F and F' to a point Q on the circle. Draw the perpendicular bisector of QF', meeting QF at P. Show that, as the point Q moves around the circle, the point P traces out an ellipse with eccentricity e, with F and F' as foci. [Join PF' then show PF+PF'=2a]