Project 2 (11/20/2020)
Maximum points 15

1. Refer to pages 72-76 and problem 4-14 of book. Use 44.5 min, 78.5 deg, r_E = 6378 km, μ_E = 3.986e5 km^3/s^2, h_1 = 4663 km, h_2 = 6352 km.
   a. Begin the semi-major axis as $a = (r_1 + r_2)/2$. Obtain the time of flight (TOF) (min) for this value of semi-major axis (km). Increase the semi-major axis (a) in steps of 4.3 % of the previous value and draw the TOF against a for 24 additional points (total of 25 points). Use a "for loop" in MATLAB.
   b. Next use a "while loop" in MATLAB; increase the semi-major axis (a) in steps of 0.43% of the previous value and verify that the time of flight (TOF) is decreasing. Break the loop when the time of flight (TOF) is between 44.5 min plus 2 sec and 44.5 min minus 2 sec. Mark this point on the same graph obtained in (a). Use this point for the subsequent calculations.
   c. Obtain ε, E, V_a, H of the orbit.
   d. Obtain the magnitude of velocities and elevation angles at both observations.
   e. What is the time of flight (TOF) between observations?
   f. What is the angle between the position angles to the two observations?
   g. Use MATLAB to draw in one diagram a circle representing Earth (r_E = 6378 km), and the orbit. The diagram must be to scale. Draw Earth center at the origin and remember Earth center is the primary focus for the orbit. Also mark the two observations on the diagram. Refer to Figures 2-5-1 and 2-5-2 of book.

The submission should be typed and have the following sections : Abstract, Introduction, Theory with equations, Results with diagrams and tables, Conclusions, References, MATLAB code.