Question 5

Consider an airplane patterned after the Beechcraft Bonanza V-tailed single-engine light private airplane.   The characteristics of this airplane are as follows: aspect ratio = 6.2, wing area = 16.82 m^2, Oswald efficiency factor = 0.91, weight = 13380 N, and zero-lift drag coefficient = 0.027.   The airplane is powered by a single piston engine capable of producing 345 hp at sea level.   Assume that the power of the engine is proportional to free-stream air density and that the two-bladed propeller has an efficiency of 0.83.

a. Calculate and plot the power required at sea level as a function of velocity.

b. Calculate the maximum velocity that can be achieved at sea level at maximum power.

c. Calculate and plot the power required at 3.66 km above sea level as a function of velocity.

d. Calculate the maximum velocity that can be achieved at 3.66 km above sea level at maximum power.   For this problem, assume that the jet engine thrust will be proportional to free-stream air density.