AAE 333 Lab#4 Prelab Questions

(2a) Write the integral for the drag using the theoretical expression for u1 given.

(2b) Assume the free stream velocity is 20 m/s, b = 0.2m, u1,max = 5 m/s, h = 0.05m, and ρ\_air = 1.2 kg/m^3. Evaluate the integral above.

MATLAB CODE

syms y

% constants

u\_max = 5;

u\_inf = 20;

b = 0.2;

h = 0.05;

rho\_air = 1.2;

%Equations

u1\_n = u\_max\*(1 - (-y/b)^(3/2))^2;

u1\_p = u\_max\*(1 - (y/b)^(3/2))^2;

D\_n = u1\_n\*(u\_inf - u1\_n);

D\_p = u1\_p\*(u\_inf - u1\_p);

D = int(D\_n, [-b 0]) + int(D\_p, [0 b]);

D = vpa(D, 7);

disp(D);

drag = 14.84416 N

(2c)

For this experiment, the data collected will be voltage and STDs. From these we can approximate the velocity as a polynomial function of the voltages. Then the drag coefficient will be calculated as a function of the Reynolds number. Finally, from the velocity and the drag coefficient the drag can be computed.