

OLUYEMI ISRAEL Annuoluwapo.  
 18/ENIG06/057  
 Mechanical Engr.  
 Eng 382: Engr. Mathematics IV.  
 19/02/2018.

### Assignment (1)

$$F_D = \frac{0.3v^2}{500 + (\ln v)^3} - 0.02v \quad (1)$$

$$F_D = mg \quad (2)$$

$$\hookrightarrow 34.3 \times 9.8 = 34.3$$

eqn (1) & (2).

$$mg = \frac{0.3v^2}{500 + (\ln v)^3} - 0.02v.$$

$$34.3 = \frac{0.3v^2}{500 + (\ln v)^3} - 0.02v$$

\* Taking  $v^2$  as Subject.

$$\frac{0.3v^2}{500 + (\ln v)^3} = 34.3 + 0.02v.$$

$$0.3v^2 = (34.3 + 0.02v) [500 + (\ln v)^3]$$

$$v^2 = \frac{(34.3 + 0.02v) \times (500 + (\ln v)^3)}{0.3}$$

$$\rightarrow v = \sqrt{\frac{(34.3 + 0.02v) \times (500 + (\ln v)^3)}{0.3}}$$

Given that: Initial guess value,  
 $v_0 = 0.5 \text{ m/s}$

\* Absolute % relative error,  $E_a(\text{Cit}+1) \leq 1E-11$ .

### MATLAB PROGRAM CODE.

Command Window

clear

clc

close all

format short g

Syms v

$v = 0.5$

for i = 1 : inf

iter(Cit+1) = i;

$v(\text{Cit}+1) = (((34.3 + (0.02 * v(\text{Cit}))) * (500 + (\log(v(\text{Cit})))^3)) / 0.3) ^ 0.5;$

$E_a(\text{Cit}+1) = \text{abs}((v(\text{Cit}+1) - v(\text{Cit})) / v(\text{Cit})) * 100;$

if  $E_a(\text{Cit}+1) \leq 1E-11$

break

end.

end

table = [iter' v'  $E_a$ ']

The estimated terminal velocity is 304.07 m/s.

Substituting in eqn (1);

$$F_D = 34.3005 \text{ approx.}$$

$$mg = 34.3$$