

Chemical Engineering

command window

clear

clc

format short

v=0.5

m=3.5

g=9.8

F=m*g

v = sqrt(((C*(F + (0.02*v))) * ((log(v)^3))) * (10*v) + 17150) / 0.3)

for i=1:10

iter(i+1)=i

v(i+1) = sqrt(((C*(F + (0.02*v(i)))) * ((log(v(i))^3))) * (10*v(i)) + 17150) / 0.3);

εa(i+1) = abs(C*(v(i+1) - v(i)) / (v(i+1))^100);

if εa(i+1) <= 1e-7

break

end

end

table = table(iter, v, εa)

output

iter	v	εa
0	0.5	0
1	239.05	99.791
2	294.17	18.736
3	302.61	2.7894
4	303.85	0.40992
5	304.04	0.060144
6	304.06	0.0088222
7	304.07	0.0012941
8	304.07	0.00018981
9	304.07	2.7842e ⁻⁰⁵

10	304.07	$4.0838e^{-06}$
11	304.07	$8.7865e^{-08}$
12	304.07	$1.2884e^{-08}$
13	304.07	$1.8904e^{-09}$
14	304.07	$2.7727e^{-10}$
15	304.07	$4.0679e^{-11}$
16	304.07	$5.9635e^{-12}$

converging at iter = 7 ; $V = 304.07$

prob.

$$F_D = \frac{0.3V^2}{500 + (1m)^3} = 0.02V$$

If $V = 304.07$

recall $F_D = 9.8 \times 3.5 = 34.30$

Substituting $V = 304.07$

$$F_D = \frac{0.3 \times (304.07)^2}{500 + (1m)^3} = 0.02 (304.07)$$

$$F_D = 40.38195931 - 6.00814$$

$$F_D = 34.31$$