

Mechanical Engineering

Command window

clear

clc

format short

v = 0.5

m = 3.5

g = 9.8

F = m * g

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

for i = 1:inf

iter(i+1) = i

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

Ea(i+1) = abs((v(i+1) - v(i)) / v(i+1)) * 100);

if Ea(i+1) <= 1E-11

break

end

end

table = table(iter, 'v', 'Ea')

Output

iter	v	Ea
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	2.7842 e-05

6	304.07	$4.0838 e^{-06}$
11	304.07	$8.7865 e^{-08}$
12	304.07	$1.2888 e^{-08}$
13	304.07	$1.8904 e^{-09}$
14	304.07	$2.7727 e^{-10}$
15	304.07	$4.0679 e^{-11}$
16	304.07	$5.9635 e^{-12}$

converging at iter = 7; $v = 304.07$

prove

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

$$500 + (\ln v)^3$$

$$\text{if } v = 304.07$$

$$\text{recall } F_D = 9.8 \times 3.5 = 34.3$$

$$\text{substituting } v = 304.07$$

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

$$F_D = 40.38195931 - 6.0814$$

$$F_D = 34.3$$