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Mechanical engineering

300 level

command windows

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	229.05	99.791
2	294.17	18.736
3	302.61	2.7894
4	303.85	0.40992
5	304.04	0.060644

6	304.06	0.0088222
7	304.07	0.0012941
8	304.07	0.00018981
9	304.07	$2.7842 e^{-05}$
10	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 of iter = 7, $v = 304.07$

Prove

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

if $v = 304.07$

Recall $f_D = 9.8 \times 3.5 = 34.30$

sub $v = 304.07$

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

$$f_D = 40.38195931 - 6.0814$$

$$f_D = 34.3$$