ENG 382

Engineering Mathematics IV

17/ENG06/101 Mechanical Engineering

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Assignment 1

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

At terminal velocity:

$F_D = mg$

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

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

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

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

$$v = \sqrt{\frac{(500 + [\ln v]^3)(mg + 0.02v)}{0.3}}$$

where $m \rightarrow 3.5kg$

$g \rightarrow 9.8 m/s^2$

$$v = \sqrt{\frac{(500 + [\ln v]^3)(3.5 \times 9.8 + 0.2v)}{0.3}}$$

$$v = \sqrt{\frac{(500 + [\ln v]^3)(34.3 + 0.2v)}{0.3}}$$

given $v_0 = 0.5$

MATLAB CODE:

1- Command Window

2- Clear

3- Clc

4- Close all

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```
format long g
v = 0.5
for i = 100
        iter(i+1) = i;
        v(i+1) = sqrt(([500 + (log(v(i)))*3]*(34.3 + (0.02*v(i))))/0.3);
        ea(i+1) = abs((v(i+1) - v(i))/v(i+1))*100;
        if ea(i+1) <= 1E-11.
                break.
        end
end.
[iter'v' ea'].
plot (v, iter).
axis tight.
grid on.
grid minor.
```

$\boxed{\text{Ans: } 304.067532285085}$

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