

Assignment 1
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 17/ENAG02/088

$$1.) F_b = m \times g$$

$$m = 3.5; g = 9.8$$

$$F_b = 3.5 \times 9.8$$

$$= 34.3$$

hence

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

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

$$17150 + 34.3 (\ln v)^3 = 0.3v^2 - (10v + 0.02v (\ln v)^3)$$

$$17150 + 34.3 (\ln v)^3 = 0.3v^2 - 10v - 0.02v (\ln v)^3 = 0.3v^2$$

$$v^2 = \frac{17150}{0.3} + \frac{34.3 (\ln v)^3}{0.3} + \frac{10v}{0.3} + \frac{0.02v (\ln v)^3}{0.3}$$

$$v^2 = 57166.67 + 114.33 (\ln v)^3 + 33.33v + 0.0667v (\ln v)^3$$

$$v = (57166.67 + 114.33 (\ln v)^3 + 33.33v + 0.0667v (\ln v)^3)^{1/2}$$

$$v_{i+1} = (57166.67 + 114.33 (\ln v)^3 + 33.33v + 0.0667v (\ln v)^3)^{1/2}$$

the final equation.

MATLAB CODE

Command Window

clear

clc

format strong g

v = 0.5;

for i = 1:inf

iter(i+1) = i

$$v(i+1) = \text{sqrt}((57166.67) + (114.33 * ((\log(v(i)))^3)) + (33.33 * v(i)) + (0.0667 * v(i) * \log(v(i))^3))$$

$$ea(i+1) = \text{abs}((v(i+1) - v(i)) / (v(i+1) * 100))$$

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

break

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end

end

tab = [iter 'v' ea']

| tab = iter | V | ea |
|------------|--------|-----------------|
| 0 | 0.5 | 0 |
| 1 | 239.05 | 99.791 |
| 2 | 294.17 | 18.736 |
| 3 | 302.61 | 2.7895 |
| 4 | 303.83 | 0.15996 |
| 5 | 304.04 | 0.060153 |
| 6 | 304.06 | 0.0088241 |
| 7 | 304.07 | 0.0012944 |
| 8 | 1 | 1 |
| 9 | 11 | 11 |
| 10 | 304.07 | $5.9635e^{-12}$ |

Converging at iter = 7 to give $V = 304.07$.

Hence the converging value of the iteration was seen as 304.07.

Proof

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

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

$$\text{rem } F_p = 9.8 \times 3.5 = 34.3$$

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

$$= \underline{34.25} \approx \underline{34.3}$$