

ASSIGNMENT 1

$$F_b = m \times g$$

$$m = 3.5; \quad g = 9.8$$

$$F_b = 3.5 \times 9.8 \\ = 34.3$$

hence

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

$$34.3 = \frac{0.3v^2}{500 + (\ln v)^3} - \frac{0.02}{1}$$

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

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

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

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

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

$$v^2 = \frac{57166.67 + 114.33(\ln v)^3 + 33.33v + 0.0667v(\ln v)^3}{0.3}$$

$$v = \sqrt{\frac{57166.67 + 114.33(\ln v)^3 + 33.33v + 0.0667v(\ln v)^3}{0.3}}$$

FINAL EQUATION:
$$v_i = \sqrt{\frac{57166.67 + 114.33(\ln v_{(i)})^3 + 33.33 v_{(i)} + 0.0667(v_{(i)})^2 (\ln v_{(i)})^3}{0.3}}$$

MATLAB CODE

Command window

clear

clc

format short g

v > 0.5

for i = 1:inf

iter (i) = i

$$V(i+1) = \sqrt{\frac{(57166.67 + 114.33 * (\log(V(i)))^3) + (33.33 * V(i)) + (0.0667 * V(i) * \log(V(i))^3)}{0.3}}$$

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

if $e_g(i+1) \leq 1E-11$

break

and

end

tab = [iter 'V' 'e_g']

tab = iter	V	e _g
0	0.5	0
1	239.05	99.791
2	294.17	18.736
3	302.61	2.7895
4	303.85	0.40996
5	304.04	0.060153
6	304.06	0.0085241
7	304.07	0.0012944
8	'	'
9	"	"
17	304.07	5.9635e ⁻¹²

Converges at iter = 7, to give $V = 304.07$.

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

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

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

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

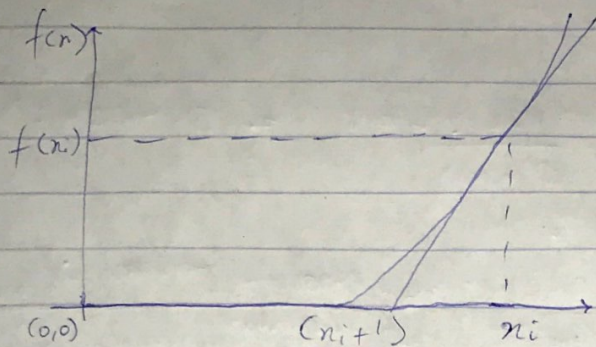
$$= 0.3 \times (304.07)^2 - 0.02(304.07)$$

$$500 + (\ln 304.07)^3$$

$$= 34.25$$

$$\approx 34.2$$

$$f(x) = e^{0.5x}(4-x) - 2$$



$$f'(x) = \frac{f(x_i) - 0}{x_i - (x_{i+1})}$$

$$f'(x_i)(x_i - (x_{i+1})) = f(x_i)$$

$$f'(x_i) * (x_i) - f'(x_i)(x_{i+1}) = f(x_i)$$

$$x_{i+1} = \frac{f'(x_i) * x_i - f(x_i)}{f'(x_i)}$$

$$x_{i+1} = x_i - \frac{f(x_i)}{f'(x_i)}$$

$$f(x) = e^{-0.5x}(4-x) - 2$$

$$f(x) = 4e^{-0.5x} - (x \cdot e^{-0.5x}) - 2$$

$$f'(x) = -0.5 \times 4(e^{-0.5x}) - (x \times (-0.5e^{-0.5x}) + e^{-0.5x} \cdot 1) - 0$$

$$f'(x) = -0.5 \times 4e^{-0.5x} - (-x \cdot 0.5e^{-0.5x} + e^{-0.5x}) - 0$$

$$= -2e^{-0.5x} + x \cdot 0.5e^{-0.5x} - e^{-0.5x}$$

Therefore if $x_0 = 0.5$ as given

$$x_{i+1} = x_i - \frac{f(x_i)}{f'(x_i)}$$

where $i=0$

$$x_{(0+1)} = x_0 - \frac{f(x_0)}{f'(x_0)}$$

$$x_0 = 0.5$$

$$x_1 = 0.5 - \frac{(e^{-0.5(0.5)}(4-0.5) - 2)}{(-2e^{-0.5 \times 0.5} + 0.5(0.5e^{-0.5 \times 0.5}) - e^{-0.5(0.5)})}$$

$$x_1 = 0.5 - \left(\frac{0.725803}{2.1417023} \right)$$

$$x_1 = 0.5 - (-0.338890)$$

~~$$x_1 = 0.5 - (-0.338890)$$~~

$$x_1 = 0.838890$$

$$\text{error} = e_1 = \frac{x(i+1) - x_i}{x(i+1)}$$

where $i=0$

$$e_1 = \frac{x_1 - x_0}{x_1} \quad e_1 = \frac{0.83889 - 0.5}{0.83889} = 0.40397$$

$$e_1 = 40.397\%$$

where $i=1$

$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} ; \quad x_2 = \frac{0.83889 - \left(e^{-0.83889 \times 0.5} (4 - 0.83889 - 2) \right)}{-2e^{-0.5 \times 0.83889} + (0.83889 \times 0.5) e^{-0.5 \times 0.83889}}$$

$$x_2 = 0.83889 - \left(\frac{0.078150}{-0.16640} \right) ; \quad 0.83889 - (-0.46965) = 0.88584$$

where $i=1$

$$\text{error} = \frac{x_2 - x_1}{x_2} = \frac{0.8858 - 0.83889}{0.8858} = 0.05295 \times 100 = 5.295\%$$

where $i=2$

$$x_3 = x_2 - \frac{f(x_2)}{f'(x_2)} ; \quad x_3 = \frac{0.8858 - \left(e^{-0.8858 \times 0.5} (4 - 0.8858 - 2) \right)}{-2e^{-0.5 \times 0.8858} + 0.8858 \times 0.5 e^{-0.5 \times 0.8858}}$$

$$x_3 = 0.8858 - \left(\frac{-0.0001476}{-1.6426} \right) ; \quad 0.8858 + 0.000091075 = 0.885891075$$

$$\text{error} = \frac{x_3 - x_2}{x_3} = \frac{0.88589 - 0.8858}{0.88589} = 0.0001015 = 0.0001015 \times 100 = 0.01\%$$

where $i=3$

$$x_4 = x_3 - \frac{f(x_3)}{f'(x_3)}$$

$$x_4 = \frac{0.88589 - \left(e^{-0.88589 \times 0.5} (4 - 0.88589 - 2) \right)}{-2e^{-0.5 \times 0.88589} + (0.88589 \times 0.5) e^{-0.5 \times 0.88589}}$$

$$x_4 = 0.88589$$

$$\begin{aligned} \text{error} &= 0.88589 - 0.88589 \\ &= 0.88589 - 0.88589 \\ &= 0\% \end{aligned}$$