ASSIGNMENT 1

$F_b = m \times g$

$m = 3.5$; $g = 9.8$

$f_b = 3.5 \times 9.8$

$= 34.3$

hence

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

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

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

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

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

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

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

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

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

FINAL EQUATION: $V_{i+1} = \sqrt{57166.67 + 114.33(\ln V_{(i)})^3 + 33.33\, V_{(i)} + 0.0667(V_{(i)})(\ln V_{(i)})^3}$

MATLAB CODE

commandwindow

clear

clc

format short g

V>0.5

for i = 1 : inf

iter (i+1) = i

V(i+1) = sqrt((57166.67 + 114.33 *((log(V(i)))^3))+(33.33 * V(i))+(0.0667 * V(i) * log(V(i)))^3)).

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ea(i+1) = (abs((V(i+1) - v(i))/v(i+1)) * 100))
  if ea(i+1) <= 1E -11
    break
    end
    end
  tab = [iter'v'ea']
```

tab = iter	V	ε_a
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	0.0088241
7	304.07	0.0012944
8	"	"
9	"	"
17	304.07	$5.5635e^{-12}$

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

Hence the converging value of the iteration was seen as 304.07

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

if V = 304.07

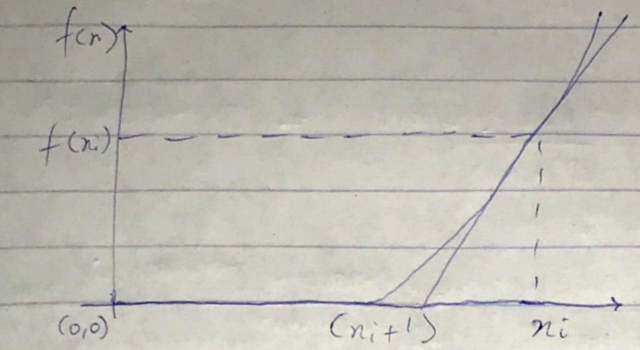
rem $f_p = 9.8 \times 3.5 = 34.3$

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

$$= 34.25$$

$$\simeq 34.3$$

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



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

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

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

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

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

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

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

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

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

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

Therefore if $x_0 = 0.5$ as given

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

when $i = 0$

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

$x_0 = 0.5$

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

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

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

$$x_1 = 0.83889$$

error = $e_a = \dfrac{x_{(i+1)} - x_{i}}{x_{(i+1)}}$

where $i = 0$

$e_a = \dfrac{x_1 - x_0}{x_1}$ $\quad e_a = \dfrac{0.83889 - 0.5}{0.8389} = 0.40397$

$e_a = 40.397\%$

where $i = 1$ $\quad x_2 = x_1 - \dfrac{f(x_1)}{f'(x_1)}$; $x_2 = 0.83889 - \dfrac{(e^{-(0.83889 \times 0.5)}(4 - 0.839) - 2}{-2e^{-(0.5 \times 0.83889)} + (0.83889 \times 0.5 \times e^{-0.5 \times 0.83} - e^{-(0.5 \times 0.83889)})}$

$x_2 = 0.83889 - \left(\dfrac{0.078150}{-0.16640}\right)$; $0.83889 - (-0.046965)$

0.8858

where $i = 1$

error $= \dfrac{x_2 - x_1}{x_2} = \dfrac{0.8858 - 0.83889}{0.8858} = 0.05295 \times 100$

$= 5.295\%$

where $i = 2$

$x_3 = x_2 - \dfrac{f(x_2)}{f'(x_2)}$; $x_3 = 0.8858 - \dfrac{(e^{-0.8888}(4 - 0.8858) - 2)}{-2e^{-(-0.5 \times 0.8858)} + 0.8859 \times 0.5 \times e^{-0.5 \times 0.8858} - (e^{-0.5 \times 0.8858})}$

$x_3 = 0.8858 - \dfrac{(-0.0001496)}{-1.6426}$; $0.8858 + 0.000091075$

$= 0.88589107 5$

error $= \dfrac{x_3 - x_2}{x_3} = \dfrac{0.88589 - 0.8858}{0.88589} = 0.0001015 = 0.01015\%$

$= 0.01\%$

where $i = 3$ $\quad x_4 = x_3 - \dfrac{f(x_3)}{f'(x_3)}$

$x_4 = 0.88589 - \dfrac{(e^{-0.88589 \times 0.5} \times (4 - 0.88589) - 2)}{-2e^{-(-0.5 \times 0.88589)} + (0.8859 \times 0.5 \times e^{(-0.5 \times 0.88589)} - e^{-(0.5 \times 0.88}}$

$x_4 = 0.88589$

error $= 0.88589 - 0.88589$

$= 0.88589 - 0.88589$

$= 0\%$

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