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MATRIC NO :- 15/ENS01/004

ENC 382 III (ASSIGNMENT)

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

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

$F'(x) = -2e^{-0.5} - (1)(e^{-0.5x}) + (-x) - 0.5e^{-0.5x}$

$= -2e^{-0.5x} - e^{-0.5x} + x0.5e^{-0.5x}$

$= x0.5e^{-0.5x} - 3e^{-0.5x}$

when $x_0 = 0.5$

$f(x_0) = 4e^{-0.5(0.5)} - xe^{-0.5(0.5)} - 2$

$= 4e^{-0.25} - (0.5)e^{-0.25} - 2$

$= 0.7258027407$

when $x_0 = 0.5$

$F'(x_0) = (0.5)0.5e^{-0.5(0.5)} - 3e^{-0.5(0.5)}$

$= 0.25e^{-0.25} - 3e^{-0.25}$

$= -2.141702153$

$\therefore x_{n+1} = x_0 - \frac{F(x_0)}{F'(x_0)}$

$= 0.5 - \frac{0.7258027407}{-2.141702153}$

$= 0.8388906061$

when $x_0 = 0.8388906061$

$f(x_0) = 4e^{-0.5(0.8388906061)} - xe^{-0.5(0.8388906061)} - 2$

$= 0.07814929777$

$F'(x_0) = (0.8388906061)0.5e^{-0.5(0.8388906061)} - 3e^{-0.5(0.8388906061)}$

$= -1.696486032$

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$$x_{n+1} = 0.8388906061 - \frac{0.07814929777}{-1.696486032}$$

$$= 0.8849560003$$

When $x_0 = 0.8849560003$

$$F(x_0) = 4e^{-0.5(0.8849560003)} - 0.8849560003e^{-0.5(0.8849560003)} - 2$$

$$= 1.23657519 \times 10^{-3}$$

$$F'(x_0) = (0.8849560003)0.5e^{-0.5(0.8849560003)} - 3e^{-0.5(0.8849560003)}$$

$$= -1.643060762$$

$$x_{n+1} = x_0 - \frac{F(x_0)}{F'(x_0)}$$

$$= 0.8849560003 - \frac{1.23657519 \times 10^{-3}}{-1.643060762}$$

$$= 0.885708605$$

When $x_0 = 0.885708605$

$$F(x_0) = 4e^{-0.5(0.885708605)} - 0.885708605e^{-0.5(0.885708605)} - 2$$

$$= 3.23521409 \times 10^{-7}$$

$$F'(x_0) = (0.885708605)0.5e^{-0.5(0.885708605)} - 3e^{-0.5(0.885708605)}$$

$$= -1.642200929$$

$$x_{n+1} = 0.885708605 - \frac{3.23521409 \times 10^{-7}}{-1.642200929}$$

$$= 0.885708802$$

$\therefore$ The required root is 0.885708802

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Percentage Absolute error

For $n=0$

$$= \frac{x_{n+1} - x_0}{x_{n+1}} \times \frac{100}{1}$$

$$= \frac{0.8388906061 - 0.5}{0.8388906061} \times \frac{100}{1}$$

$$= 40.397473$$

For $n=1$

$$= \frac{0.8849560003 - 0.8388906061}{0.8849560003} \times \frac{100}{1}$$

$$= 5.205388085$$

For $n=2$

$$= \frac{0.885708605 - 0.884956003}{0.885708605} \times \frac{100}{1}$$

$$= 0.085044002 16$$

For $n=3$

$$= \frac{0.885708802 - 0.885708605}{0.0885708802} \times \frac{100}{1}$$

$$= 2.224207319 \times 10^{-5}$$

n	x	Error
0	0.5	40.397473
1	0.8388906061	5.205388085
2	0.884956003	0.085044002 16
3	0.885708605	$2.224207319 \times 10^{-5}$
4	0.885708802	

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2. $F_D = mg$

$= 3.5 \times 9.8$

$= 34.3$

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

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

$$v_{i+1} = v_i - \frac{f(v_i)}{f'(v_i)}$$

$$f(v_i) = \frac{0.3v_i^2}{300 + (\ln v_i)^3} - 0.02v_i - 34.3$$

$$f'(v_i) = \frac{d}{dv}\left[\frac{0.3v_i^2}{300 + (\ln v_i)^3}\right] - 0.02$$

$$\frac{d}{dv}\left[\frac{0.3v_i^2}{300 + (\ln(v_i)^3)}\right] =$$

$a = 0.3v_i^2$ $\qquad$ $b = 500 + (\ln(v_i))^3$

$\frac{du}{dv} = 0.6v_i^2$ $\qquad$ $\frac{db}{dv} = 3(\ln(v_i))^2\left(\frac{1}{v}\right)$

$$= \frac{b\frac{du}{dv} - a\frac{db}{dv}}{b^2}$$

$$= \frac{[500 + (\ln(v_i))^3(0.6v_i^2)] - [0.3v_i^2((3\ln(v_i))^2(\frac{1}{v})]}{[500 + (\ln(v_i))^3]^2} - 0.02$$

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