

Osanyintuyi Olusotobi Deborah.

15/ENG 06059

Mechanical Engineering

ENG 382.

(1) Problem Statement One:  $f(n) = e^{-0.5n} (4-n) - 2$

$$f'(n) = e^{-0.5n} (-1) + (4-n) (-0.5e^{-0.5n})$$

$$f'(n) = -e^{-0.5n} - 2e^{-0.5n} + 0.5ne^{-0.5n}$$

$$f'(n) = -3e^{-0.5n} + 0.5ne^{-0.5n}$$

$$x_{i+1} = x_i - \frac{e^{-0.5x_i} (4-x_i) - 2}{-3e^{-0.5x_i} + 0.5x_i e^{-0.5x_i}}$$

$$x_1 = \frac{0.5 - \frac{e^{-0.5(0.5)} (4-0.5) - 2}{-3e^{-0.5(0.5)} + 0.5(0.5)e^{-0.5(0.5)}}}{1}$$

$$x_1 = 0.838890606$$

$$\text{error}_1 = \left| \frac{0.838890606 - 0.5}{0.838890606} \right| \times 100 = 40.39445855$$

$$x_2 = 0.838890606 - \frac{e^{-0.5(0.838890606)} [4 - 0.838890606] - 2}{-3e^{-0.5(0.838890606)} + 0.5(0.838890606)e^{-0.5(0.838890606)}}$$

$$x_2 = 0.8849559424$$

$$\text{error}_2 = \left| \frac{0.8849559424 - 0.838890606}{0.8849559424} \right| \times 100 = 5.205381897$$

$$x_3 = 0.8849559424 - \frac{e^{-0.5(0.8849559424)} [4 - 0.8849559424] - 2}{-3e^{-0.5(0.8849559424)} + 0.5(0.8849559424)e^{-0.5(0.8849559424)}}$$

$$x_3 = 0.8857083129$$

$$\text{error}_3 = \left| \frac{0.8857083129 - 0.8849559424}{0.8857083129} \right| \times 100 = 0.08494562866$$

$$x_4 = 0.8857083129 - \frac{e^{-0.5(0.8857083129)} [4 - 0.8857083129] - 2}{-3e^{-0.5(0.8857083129)} + 0.5(0.8857083129)e^{-0.5(0.8857083129)}}$$

$$u_4 = 0.885708802$$

$$\text{error}_4 = \left| \frac{0.885708802 - 0.8857083129}{0.885708802} \right| \times 100 = 5.522130963 \times 10^{-5}$$

$$u_5 = 0.885708802 - \frac{e^{-0.5(0.885708802)}(4 - 0.885708802) - 2}{-3e^{-0.5(0.885708802)} + 0.5(0.885708802)e^{-0.5(0.885708802)}}$$

$$u_5 = 0.885708802$$

$$\text{error} = \left| \frac{0.885708802 - 0.885708802}{0.885708802} \right| \times 100$$

$$= 5.394210816 \times 10^{-10}$$

Due to max. percentage error given as  $1 \times 10^{-7}$  we will stop at the 5th iteration.

i	u	error
0	0.5	—
1	0.838890606	40.39745855
2	0.8849552424	5.205381897
3	0.8857083129	0.08499562862
4	0.885708802	$5.522130963 \times 10^{-5}$
5	0.885708802	$5.394210816 \times 10^{-10}$