

Oyedahun Chenwoke Jude

Chemical Engineering (16/ENG01/017)

ENG 382 Assignment 2

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

Solution:

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

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

$$f'(x) = u = e^{-0.5x} \quad v = 4-x$$

$$f'(x) = \frac{dy}{dx} = v \frac{du}{dx} + u \frac{dv}{dx}$$

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

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

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

i	x	$E_n$
0	0.5	0
1	0.838890606	40.39747299
2	0.8849557809	5.205386017
3	0.8857086071	0.08497447061
4	0.885708802	
5		
6		
7		

$$x_{0.5} = 0.5 - \frac{e^{-0.5(0.5)}(4-0.5) - 2}{0.5e^{-0.5(0.5)}(0.5-4) - e^{-0.5(0.5)}} \\ = 0.838890606$$

$$E_{92} \text{ error} = \left| \frac{x_{i+1} - x_i}{x_{i+1}} \right| \times 100\%$$

$$= \left| \frac{0.838890606 - 0.5}{0.838890606} \right| \times 100 \\ = 40.39747299\%$$

$$x_2 = 0.838890606 - \frac{e^{-0.5(0.838890606)}(4-0.838890606) - 2}{0.5e^{-0.5(0.838890606)}(0.838890606-4) - e^{-0.5(0.838890606)}} = 0.8849557809$$

$$E_n = \left| \frac{0.8849557809 - 0.838890606}{0.8849557809} \right| \times 100 \\ = 0.08497447061\%$$

$$X_4 = \frac{0.8852086071 - e^{-0.5(0.8857086071)} (4 - 0.8857086071) - 2}{0.5e^{-0.5(0.8857086071)} (0.8857086071 - 4) - e^{0.5(0.8857086071)}}$$

$$E_9 = \left| \frac{0.885708802 - 0.885708802}{0.885708802} \right| \times 100 = 2.200477495 \times 10^{-5}$$

$$X_5 = \frac{0.885708802 - e^{-0.5(0.885708802)} (4 - 0.885708802) - 2}{0.5e^{-0.5(0.885708802)} (0.885708802 - 4) - e^{0.5(0.885708802)}}$$

$$= 0.885708802$$

$$E_9 = \left| \frac{0.885708802 - 0.885708802}{0.885708802} \right| \times 100$$

$$= 0$$