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 15/EN/01/031  
 PETROLEUM ENGINEERING  
 ENG 382 ASSIGNMENT II

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

Initial Guess Value = 0.5

Recall;  $x_{i+1} = x_i - \frac{f(x_i)}{f'(x_i)}$  [Newton Raphson Method]

For  $x_1 = 0.5$

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

$$= 0.7258027407$$

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

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

$$= -2.141702153$$

$$x_{i+1} = 0.5 - \frac{0.7258027407}{-2.141702153}$$

$$= 0.5 + 0.3388906061 = 0.8388906061$$

For  $x_2 = 0.8388906061$

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

$$= 0.07814929777$$

$$f'(x) = -e^{-0.5(0.8388906061)} - (0.5e^{-0.5(0.8388906061)})(4-0.8388906061)$$

$$= -1.6964860332$$

$$x_{i+1} = 0.83889061 - \frac{0.07814929116}{-1.696486027}$$

$$= 0.83889061 + 0.04606539041$$

$$= 0.8849560004$$

For  $x_3 = 0.8849560004$

$$f(x) = e^{-0.5(0.8849560004)}(4-0.8849560004) - 2$$

$$= 0.001236575026$$

$$f'(x) = -e^{-0.5(0.8849560004)} - (0.5e^{-0.5(0.8849560004)})(4-0.8849560004)$$

$$= -1.643060762$$

$$\therefore x_{i+1} = 0.8849560004 - \frac{0.001236575026}{-1.643060762}$$

$$= 0.885708605$$

For  $x_4 = 0.8857086050$

$$f(x) = e^{-0.5(0.8857086036)}(4-0.8857086036) - 2$$

$$f(x) = 3.25820488 \times 10^{-7}$$

$$f'(x) = -e^{-0.5(0.8857086036)} - \left[ (0.5e^{-0.5(0.8857086036)}) (4 - 0.8857086036) \right]$$

$$= -1.642200931$$

$$\therefore x_{(i+1)} = 0.8857086036 - \frac{(3.25820488 \times 10^{-7})}{-1.642200931}$$

$$= 0.885708802$$

$$\text{For } x_5 = 0.885708802$$

$$f(x) = \left[ e^{-0.5(0.885708802)} \right] (4 - 0.885708802) - 2$$

$$= 7.846 \times 10^{-12}$$

$$f'(x) = \left[ -e^{-0.5(0.885708802)} \right] - \left[ (0.5e^{-0.5(0.885708802)}) (4 - 0.885708802) \right]$$

$$= -1.642200955$$

$$\therefore x_{(i+1)} = 0.885708802 - \frac{(7.846 \times 10^{-12})}{-1.642200955}$$

$$= 0.885708802$$

$$= 0.885708802$$

i	$x_i$	$f(x_i)$	$f'(x_i)$	$x_{(i+1)}$
0	0.5	0.7258027407	-2.141702153	0.8388906061
1	0.8388906061	0.07814929777	-1.6964860332	0.8849560004
2	0.8849560004	0.001236575026	-1.643060762	0.885708605
3	0.8857086036	$3.25820488 \times 10^{-7}$	-1.642200931	0.885708802
4	0.885708802	$7.846 \times 10^{-12}$	-1.642200955	0.885708802