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16/ENG07/019

Petroleum Engineering

ENG 382

Assignment 2

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

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

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

$$v = 4-x$$

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

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

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

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

i	x	F _n
0	0.5	0
1	0.838890606	40.39747299
2	0.8849559809	5.208886019
3	0.8857086071	0.0877447061
4	0.885708802	

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

$$= 0.838890606$$

$$\bar{I}_n \% \text{ error} = \left[\frac{X_{n+1} - X_n}{X_{n+1}} \right] \times 100\%$$

$$= \left[\frac{0.838890606 - 0.5}{0.838890606} \right] \times 100$$

$$= 40.3917299$$

$$X_2 = 0.838890606 - \frac{e^{-0.5(0.838890606)} (4 - 0.838890606) - 2}{0.5e^{-0.5(0.838890606)} (0.838890606 - 4) - e^{-0.5(0.838890606)}}$$

$$= 0.8849559809$$

$$\bar{I}_2 = \left[\frac{0.8849559809 - 0.838890606}{0.8849559809} \right] \times 100$$

$$= 5.205386019$$

$$X_3 = 0.8849559809 - \frac{e^{-0.5(0.8849559809)} (4 - 0.8849559809) - 2}{0.5e^{-0.5(0.8849559809)} (0.8849559809 - 4) - e^{-0.5(0.8849559809)}}$$

$$= 0.8857086071$$

$$\bar{I}_3 = \left[\frac{0.8857086071 - 0.8849559809}{0.8857086071} \right] \times 100$$

$$= 0.8497447061$$

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

$$= 0.885708802$$

$$\bar{I}_4 = \left[\frac{0.885708802 - 0.8857086071}{0.885708802} \right] \times 100$$

$$= 2.200497495 \times 10^{-5}$$

$$X_b = 0.88708802 - e^{-0.500 \cdot 0.88708802} (1 - 0.885708802) - 0.5e^{-0.500 \cdot 0.885708802} (0.885708802 - 1) - e^{-0.600 \cdot 0.88708802}$$

$$= 0.885708802$$

$$\bar{I}_A = \left[\frac{0.885708802 - 0.885708802}{0.885708802} \right] \times 100$$

$$= 0$$

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