

ENG 382 2

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

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

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

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

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

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

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

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

	x	Err	Fa
0	0.5		0
1	0.838890606		40.89747299
2	0.8849559809		5.205386019
3	0.8867086071		0.08297447061
4	0.885708802		

$$x_{0+1} = \frac{0.5 - e^{-0.5(0.5)} (4-0.5) - 2}{e^{-0.5(0.5)} (0.5-4) - e^{-0.5(0.5)}}$$

$$= 0.838890606$$

$$\text{Fa \% error} = \left[\frac{x_{n+1} - x_n}{x_{n+1}} \right] \times 100\%$$

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

$$= 40.39747299$$

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

$$= 0.8849559809$$

$$f_a = \left| \frac{0.8849559809 - 0.838890606}{0.8849559809} \right| \times 100$$

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

$$= 0.8857086071$$

$$f_a = \left| \frac{0.8857086071 - 0.8849559809}{0.8857086071} \right| \times 100$$

$$= 0.8497447061$$

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

$$= 0.885708802$$

$$f_a = \left| \frac{0.885708802 - 0.8857086071}{0.885708802} \right| \times 100$$

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

$$X_0 = \frac{0.88708802 - (0.5(0.88708802)) (4 - 0.88708802) - 2}{0.6(0.885708802) (0.885708802 - 4) - (0.5(0.885708802))}$$

$$= 0.885708802$$

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

$$= 0$$