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161ENG041018

ENG 382 [ASSIGNMENT 2]

ELECT/ELEI

~~Ass~~

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

$$x_0 = 0.5$$

using product rule

$$u = e^{-0.5x} \quad v = (4-x) - 2$$

$$\frac{du}{dx} = -0.5e^{-0.5x}$$

$$\frac{dv}{dx} = -1$$

$$\frac{dy}{dx} = u \frac{du}{dx} + v \frac{dv}{dx}$$

$$\frac{dy}{dx} = -\frac{1}{2}e^{-0.5x} (4-x) - e^{-0.5x}$$

$$\therefore f'(x) = \frac{1}{2}e^{-0.5x} (x-4) - e^{-0.5x}$$

$$f(x_0) = e^{-0.5(0.5)} (4-0.5) - 2 = 0.7258$$

$$f'(x_0) = \frac{1}{2}e^{-0.5 \times 0.5} (0.5-4) - e^{-0.5(0.5)} = -2.1417$$

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = 0.5 - \frac{0.7258}{-2.1417} = 0.83889$$

$$\text{Error} = \frac{x_1 x_0 \times 100}{x_1} = \frac{0.83889 - 0.5 \times 100}{0.83889} = 40.8\%$$

$$\text{when } x_1 = 0.83889$$

when $i = 1$

$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)}$$

$$f(x_1) = e^{-0.5(0.83889)} (4-0.83889) - 2 = 0.078150$$

$$f'(x_1) = \frac{1}{2}e^{-0.5(0.83889)} (0.83889-4) - e^{-0.5(0.83889)} = -1.6640$$

$$x_2 = 0.83889 - \left(\frac{0.078150}{-1.6640} \right) \quad x_2 = 0.8858$$

when $\delta = 1$

$$\text{error} = \frac{x_2 - x_1}{x_1} = \frac{0.8858 - 0.83569}{0.83569} \times 100 \\ = 0.05295 \times 100 = 5.295\%$$

when $\delta = 2$

$$f(x_2) = e^{-0.5(0.8858)} (4 - 0.8858) - 2 = -0.004497$$

$$f'(x_2) = \frac{1}{2} e^{-0.5(0.8858)} (0.8858 - 4) - e^{-0.5(0.8858)} = -1.6426$$

$$x_3 = x_2 - \frac{f(x_2)}{f'(x_2)}$$

$$= 0.8858 - \left[\frac{-0.004497}{-1.6426} \right]$$

$$= 0.8858 - 0.1124 \times 10^{-4} \\ = 0.8848$$