

In n Raphael

Assignment 2

Iqwe Raphael

IG/ENG04/025

ENG 382

Electrical Engineering

$$f(x) = e^{-0.5x} (4-x) - 2 \quad x_0 = 0.5$$

using product rule

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

$$\frac{\partial u}{\partial x} = -0.5e^{-0.5x} \quad \frac{\partial v}{\partial x} = -1$$

$$\frac{\partial y}{\partial x} = u \frac{\partial v}{\partial x} + v \frac{\partial u}{\partial x}$$

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

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

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

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

$$= -2.1417$$

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

$$= 0.5 - \frac{0.7258}{-2.1417}$$

$$= 0.83889$$

$$\text{error} = \frac{x_1 - x_0}{x_1} \times 100 \quad \text{when } x_1 = 0.83889$$

$$\frac{0.83889 - 0.5}{0.83889} \times 100 = 40.4\%$$

When $i = 1$

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

$$f(x_1) = e^{-0.5(0.83889)}(4 - 0.83889) - 2 = 0.078190$$

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

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

$$x_2 = 0.8858$$

When $i = 1$

$$\begin{aligned} \text{error} &= \frac{x_2 - x_1}{x_2} = \frac{0.8858 - 0.83889}{0.8858} \times 100 \\ &= 0.05295 \times 100 = 5.295\% \end{aligned}$$

When $i = 2$

$$f(x_2) = e^{-0.5(0.8858)}(4 - 0.8858) - 2 = -0.0001497$$

$$f'(x_2) = \frac{1}{2} e^{-0.5(0.8858)}(0.8858 - 4) - e^{-0.5(0.8858)} = -1.6428$$

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

$$= 0.8858 - \left[\frac{-0.0001497}{-1.6420} \right]$$

$$= 0.8858 - 9.1124 \times 10^{-4}$$

$$= 0.8848$$