

### Assignment 2

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

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

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

$$f(x) = \frac{e^{-0.5x} (4-x) - 2}{-e^{-0.5x} (4-x) - 2e^{-0.5x} + 0.5xe^{-0.5x}}$$

$$f'(x) = \frac{0.5xe^{-0.5x} - 3e^{-0.5x}}{0.5xe^{-0.5x} - 3e^{-0.5x}}$$

$$x_{i+1} = x_i - \frac{f(x_i)}{f'(x_i)}$$

when  $x = 0.5$

$$x_1 = 0.5 - \left( \frac{e^{-0.5 \times 0.5} (4 - 0.5) - 2}{(0.5 \times 0.5)e^{-0.5 \times 0.5} - 3e^{-0.5 \times 0.5}} \right) - (3e^{-0.5 \times 0.5})$$

$$x_1 = 0.838890606$$

when  $x = 0.838890606$

$$x_2 = 0.838890606 - \left( \frac{e^{-0.5 \times 0.838890606} (4 - 0.838890606) - 2}{(0.5 \times 0.838890606)e^{-0.5 \times 0.838890606} - 3e^{-0.5 \times 0.838890606}} \right) - (3e^{-0.5 \times 0.838890606})$$

$$x_2 = 0.88496$$

$$x_3 = 0.88496 - \left( \frac{e^{-0.5 \times 0.88496} (4 - 0.88496) - 2}{(0.5 \times 0.88496)e^{-0.5 \times 0.88496} - 3e^{-0.5 \times 0.88496}} \right) - (3e^{-0.5 \times 0.88496})$$

$$x_3 = 0.88570$$

when  $x = 0.88570$

$$x_4 = 0.88570 - \left( \frac{e^{-0.5 \times 0.88570} (4 - 0.88570) - 2}{(0.5 \times 0.88570)e^{-0.5 \times 0.88570} - 3e^{-0.5 \times 0.88570}} \right) - (3e^{-0.5 \times 0.88570})$$

$$x_4 = 0.88571$$

when  $x = 0.88571$

$$x_5 = 0.88571 - \left( \frac{e^{-0.5 \times 0.88571} (4 - 0.88571) - 2}{(0.5 \times 0.88571)e^{-0.5 \times 0.88571} - 3e^{-0.5 \times 0.88571}} \right) - (3e^{-0.5 \times 0.88571})$$



$$x_5 = 0.88571$$

$$x_6 = 0.88571 - \frac{(0.5 \times 0.88571) \left( \frac{4 - 0.88571}{0.5 \times 0.88571} \right) - 2}{(0.5 \times 0.88571) \left( \frac{4 - 0.88571}{0.5 \times 0.88571} \right) - (3e^{-0.5 \times 0.88571})}$$

$$x_6 = 0.88571$$

for error

$$E_a = \left| \frac{x_{i+1} - x_i}{x_{i+1}} \right| \times 100\%$$

$$E_a = \frac{0.85889060 - 0.5 \times 100\%}{0.85889060} \quad E_a = 40.397\%$$

$$E_{a2} = \frac{0.88496 - 0.85889060}{0.88496} \times 100$$

$$E_{a2} = 5.2059$$

$$E_{a3} = \frac{0.88570 - 0.88496}{0.88570} \times 100 = 0.0849\%$$

$$E_{a4} = \frac{0.88571 - 0.88570}{0.88571} \times 100\% = 2.224 \times 10^{-5}\%$$

$$E_{a5} = \frac{0.88571 - 0.88571}{0.88571} \times 100\%$$

$$E_{a5} = 0\%$$

i	x	E <sub>a</sub> (%)
0	0.5	40.397
1	0.8588906	5.205
2	0.88496	0.0849
3	0.88570	2.224 × 10 <sup>-5</sup>
4	0.88571	0
5	0.88571	0