3-)

a-) Newton Raphson

ilk tahmin $x_i^0 = 0,3$

$f(x) = 7\sin(x)e^{-x} - 1$

$f'(x) = 7\cos x\, e^{-x} - 7\sin x\, e^{-x}$

$$x_{i+1} = x_i^0 - \frac{f(x_i)}{f'(x_i)} = 0,3 - \frac{f(0,3)}{f'(0,3)} = 0,144376$$

$$\varepsilon_a = \left| \frac{0,144376 - 0,3}{0,144376} \right| \times 100\% = 170,1\%$$

— Second Iteration

$$x_{i+1} = 0,144376 - \frac{f(0,144376)}{f'(0,144376)} = 0,169408$$

$$\varepsilon_a = \left| \frac{0,169408 - 0,144376}{0,169408} \right| \times 100\% = 14,77\%$$

— Third iteration

$$x_{i+1} = 0,169408 - \frac{f(0,169408)}{f'(0,169408)} = 0,170179$$

$$\varepsilon_a = \left| \frac{0,170179 - 0,169408}{0,170179} \right| \times 100\% = 0,45\%$$

2-) Secant Metod

$$x_{i+1} = x_i^0 - \frac{f(x_i)(x_{i-1} - x_i)}{f(x_{i-1}) - f(x_i)}$$

$x_i^0 = 0,4$

$x_{i-1} = 0,5$

$$x_{i+1} = 0,4 - \frac{f(0,4)(0,5 - 0,4)}{f(0,5) - f(0,4)} = 0,002782 = x_1$$

Second Iteration

$x_{i-1} = 0,4$, $x_i^0 = 0,002782$

$$X_2 = 0,002782 - \frac{f(0,002782)(0,4 - 0,002784)}{f(0,4) - f(0,002782)} = 0,21823$$

$$E_a = \left| \frac{0,218236 - 0,002782}{0,218236} \right| \times 100\% = 98,7\%$$

third iteration

$x_{i-1} = 0,002782$, $x^0 = 0,218236$

$$X_3 = 0,218236 - \frac{f(0,218236)(0,002782 - 0,218236)}{f(0,002782) - f(0,218236)} = 0,178$$

$$E_a = \left| \frac{0,11789 - 0,218236}{0,11789} \right| \times 100\% = 21,86\%$$

fourt Iteration

$x_{i-1} = 0,218236$, $x_i = 0,11789$

$$X_4 = 0,11789 - \frac{f(0,11789)(0,218236 - 0,11789)}{f(0,218236) - f(0,11789)} = 0,1696$$

$$E_a = \left| \frac{0,1696 - 0,11789}{0,1696} \right| \times 100\% = 5,43\%$$

Fifth iteration

$x_{i-1} = 0,1789$, $x_i = 0,1696$

$$x_5 = 0,1696 - \frac{f(0,1696)(0,1789 - 0,1696)}{f(0,1789) - f(0,1696)} = 0,1701$$

$$\varepsilon_a = \left| \frac{0,1701 - 0,1696}{0,1701} \right| \times 100\% = 0,29\%$$

:-) Modified Secant Method

$$x_{i+1} = x_i - \frac{\delta x_i f(x_i)}{f(x_i + \delta x_i) - f(x_i)} \qquad x_i = 0,3 \qquad \delta = 0,01$$

$$x_1 = 0,3 - \frac{(0,01)(0,3) f(0,3)}{f(0,3 + 0,3(0,01)) - f(0,3)} = 0,143698$$

$$\varepsilon_a = \left| \frac{0,143698 - 0,3}{0,143698} \right| \times 100\% = 108\%$$

second

$x_i = 0,143698$

$$x_2 = 0,143698 - \frac{(0,01)(0,143698) f(0,143698)}{f(0,143698 + (0,01)(0,143698)) - f(0,143698)}$$

$x_2 = 0,1694$

$$\varepsilon_a = \left| \frac{0,1694 - 0,143698}{0,1694} \right| \times 100\% = 15,17\%$$

third

$x_i = 0,1694$

$$x_3 = 0,1694 - \frac{(0,01)(16,94) f(0,1694)}{f(0,1694 + 10,01)(0,1694)) - f(0,1694)} = 0,17018$$

$$\varepsilon_a = \left| \frac{0,17018 - 0,1694}{0,17018} \right| \times 100\% = 0,45\%$$