AWANABA CHIBUIKEM
16/ENG06/1012
MEE 382
ASSIGNMENT II

① If the maximum percentage absolute error is desired to be $1\varepsilon-9$, using the Newton-Raphson Iteration Method and initial guess value of 0.5, find the root of the function given in equation (1.1)

a) Manually and
b) With the aid of MATLAB

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

NB: For the manual solution, use all the values given by the calculator

Soln

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

Let $u = e^{-0.5x}$ and $v = (4-x)$

$du = 0.5e^{-0.5x}$ $\therefore dv = -1$

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

GENERAL NEWTON-RAPHSON'S FORMULAR

$x_{n+1} = x_n = f(x_n) / f'(x_n)$

$f(x_0) = f(0.5) = 0.7258027407$

$f'(x_0) = f'(0.5) = -2.141702153$

$x_1 = x_0 - f(x_0)/f'(x_0) = 0.8388906061$,

$f(x_1) = 0.07814929774$

$f'(x_1) = -1.696486032$

$x_2 = x_1 - f(x_1)/f'(x_1) = 0.8857086054$,

$f(x_3) = 3.235835571 \times 10^{-7}$

$f'(x_3) = -1.642200929$

$x_4 = x_3 - f(x_3)/f'(x_3) = 0.885708802$,

$f(x_4) = 7.845 \times 10^{-12}$

$f'(x_4) = -1.642200704$

$x_5 = x_4 - f(x_4)/f'(x_4) = 0.885708802$,

$\therefore$ 0.885708802 is the root of eqn (1.1)

MATLAB ASSIGNMENT II

```
function [x1, err, relerr] = assign2(x0, maxi, tol, iter, f, fprime)
    x0 = 0.5;
    maxi = 100;
    tol = 0.000000001;
    iter = 1;
    f = @(x)((exp(0.5*x))*(4-x))-2;
    fprime = @(x)(-exp(0.5*x)+((-0.5*exp(-0.5*x))*(4-x)));
    for i = 1:maxi
        x1 = x0 - feval(f,x0)/feval(fprime,x0);
        err = abs(x1-x0); relerr = abs(x1-x0)/x1;
        fprintf('%2.0f %10.10f %10.10f %10.10f %10.10f\n',
                iter, x0, x1, err, relerr)
    x0 = x1; iter = 1+iter;
    if err <= tol, break, end
    end
```