Assignment 2

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16/Eng06/007
Mechanical

ENG382

If the maximum percentage absolute error is desired to be $\pm E-9$, using the Newton-Raphson iteration method and initial guess value of 0.5, find the root of the function given in eqn (1-1)

(a) manually and

(b) With the aid of MATLAB

Sol

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

$f'(x) =$

Let $u = e^{-0.5x}$ & $V = (4-x)$

$\delta u = -0.5e^{-0.5x}$; $\delta V = -1$

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

$x_0 = 0.5$ [Initial Guess]

General Newton Raphson Formula

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

$f(x_0) = f(0.5) = 0.725827707$

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

$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = 0.838890606$

$f(x_1) = 0.078142977$

$f'(x_1) = -1.642200929$

$x_4 = x_3 - \frac{f(x_3)}{f'(x_3)} = 0.885708802$

$f(x_4) = 7.845 \times 10^{-3}$

$f'(x_4) = -1.642200704$

$x_5 = x_4 - \frac{f(x_4)}{f'(x_4)} = 0.885708802_0$

MATLAB

1. Function [x1, err,] = (x0, max1, tol, iter, f, prime)

```
x0 = 0.5;
max1 = 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 ; max1
    x1 = x0 - feval (f, x0) / feval (fprime,
    x0);
    err = abs (x1 - x0); velear = abs (x1-x0)
        / x1;
fprintf ('%2.0f %10.10f %9.10f %10.10f %10.10f
    %10.10f %10.10f %10.10f \n', iter, x0,
    x1, err, velear)
x0 = x1; iter = 1 + iter;
ferr< = tol, break, end
end
```