

### **Tasks for 28/01/2019:**

**Newton-Raphson for finding reciprocal of a number:** The reciprocal of a real number  $a$  is defined as a zero of the function:  $f(x) = 1/x - a$ .

The function converges for an initial estimate in the range  $0 < x_0 < 2/a$ .

a) Write a matlab code that will be able to find the reciprocal of any real number using Newton-Raphson method. Do not set an error limit. Rather let the code run for a fixed number of 50 iterations

b) Plot the error propagation (by comparing the outcome of the code and  $1/a$ ) and plot is as a function of the iteration

**Newton-Raphson for simultaneous non-homogeneous equations:** Consider the set of algebraic equations,

$$x + y + z = 3$$

$$x^2 + y^2 + z^2 = 5$$

$$e^x + xy - xz = 1$$

a) Use Newton-Raphson method to solve this system of equations with a starting guess of  $(x,y,z) = (1, 0, 0)$ . See if the values converge to (1.2244, -0.0931, 1.8687). If we use (1, 0,1) as the initial guess do we get the same root?

b) Check if  $(x,y,z) = (0,0,0)$  fails as a initial guess. Why?

c) Try plotting maximum absolute error of each iteration as a function of number of iteration in semi log scale to check error propagation.

**Diagonal dominance of matrix:** Consider the square matrices:

$$A = \begin{bmatrix} -6 & 2 & 1 & 2 & 1 \\ 3 & 8 & -4 & 1 & 0 \end{bmatrix};$$

$$\begin{bmatrix} 3 & 8 & -4 & 1 & 0 \end{bmatrix};$$

```
-1 1 4 10 1;
```

```
3 -4 1 9 2;
```

```
2 0 1 3 10]
```

```
B=[18 3 6 -3;
```

```
9 13 -5 2;
```

```
-3 -2 4 9;
```

```
6 0 11 3]
```

Write a code to see if the matrices A and B are diagonally dominant. In case if they are not, make the code display a message like “Not strictly diagonally dominant on row (row number)”