

NTHAMU, PATRICK TIMOTHY

COMPUTER ENGINEERING

ENG 381: ENGINEERING MATHS IV

Question 1

- (a) Using an initial guess vector of $M_0 = [0; 0; 0]$, determine the values of the variables in Equation (1) using Jacobi Iterative Method Manually showing only three iterations.
- (b) Write a MATLAB m-file program to solve the problem in (a) and tabulate the results showing the number of iterations, the corresponding values of the variables and the error, which is calculated from the norms. Take the tolerance of the error to be $1E-15$

$$\begin{cases} 10M_1 - 2M_2 + M_3 = 9 \\ -2M_1 + 10M_2 - 2M_3 = 12 \\ -2M_1 - 5M_2 + 10M_3 = 18 \end{cases}$$

Solution

from eqn (1)

$$M_1 = \frac{9}{10} + \frac{2M_2}{10} - \frac{M_3}{10}$$

from eqn (2)

$$M_2 = \frac{12}{10} + \frac{2M_1}{10} + \frac{2M_3}{10}$$

from eqn (3)

$$M_3 = \frac{18}{10} + \frac{2M_1}{10} + \frac{5M_2}{10}$$

$$M_1 = 0.9 + 0.2M_2 - 0.1M_3$$

$$M_2 = 1.2 + 0.2M_1 + 0.2M_3$$

$$M_3 = 1.8 + 0.2M_1 + 0.5M_2$$

Substituting (0) as $M_1, M_2 \nless M_3$

$$M_1 = 0.9 + 0.2(0) - 0.1(0) = 0.9$$

$$M_2 = 1.2 + 0.2(0) + 0.2(0) = 1.2$$

$$M_3 = 1.8 + 0.2(0) + 0.5(0) = 1.8$$

Substituting $M_1 = 0.9, M_2 = 1.2 \nless M_3 = 1.8$

$$M_1 = 0.9 + 0.2(1.2) - 0.1(1.8) = 0.96$$

$$M_2 = 1.2 + 0.2(0.9) + 0.2(1.8) = 1.74$$

$$M_3 = 1.8 + 0.2(0.9) + 0.5(1.2) = 2.58$$

Substituting $M_1 = 0.96, M_2 = 1.74 \nless M_3 = 2.58$

$$M_1 = 0.9 + 0.2(1.74) - 0.1(2.58) = 0.99 //$$

$$M_2 = 1.2 + 0.2(0.96) + 0.2(2.58) = 1.91 //$$

$$M_3 = 1.8 + 0.2(0.96) + 0.5(1.74) = 2.86 //$$

1- [] function $x = myJacobi(A, b, x_0)$

3- $b_2 \{ 9 \ 12 \ 18 \}';$

5- $\text{Max } z = 100$

7- $n = \text{length}(b);$

9- for $i = 1:n$

15	$1/A(i,i)$
----	------------

13- $err = abs(nam(x' - x_0))i$

15- $X \cap Z = X'$

17- break

19- end

21- $\text{table} = [i' x' \text{value}]$