



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 35



DEPARTMENT OF MATHEMATICS

SOLUTIONS OF EQUATIONS

1. Write the iterative formula of Newton-Raphson method.

Solution:

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

2. What are the merits of Newton's method of iteration?

Solution:

Newton's method is successfully used to improve the result obtained by other methods. It is applicable to the solution of equations involving algebraical functions as well as transcendental functions.

3. State the order of convergence and convergence condition for Newton's Raphson method.

Solution:

Order of convergence is 2.[ie quadratic]

Condition for convergence is $|f(x)f''(x)| < |f'(x)|^2$

4. Write the two method to solve simultaneous linear algebraic equations:

Solution:

By Direct Method:

1)Gauss Elimination Method and

2) Gauss Jordan Method

By Indirect (or) Iterative Method:

1)Gauss Jacobi Method and

2) Gauss Seidal Method

5. Compare Gauss elimination & Gauss Jordan method.

Gauss Elimination Method	Gauss Jordan Method
1)Coefficient matrix is transformed into upper triangular matrix.	Coefficient matrix is transformed into upper diagonal matrix
2)Direct method,need the back substitution method to obtain the solution	Indirect method,no need of back substitution method



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6. Write a sufficient condition for Gauss-seidal & Jacobi method to converge.

Solution:

Let the linear equation be,

$$a_1x + b_1y + c_1z = d_1$$

$$a_2x + b_2y + c_2z = d_2$$

$$a_3x + b_3y + c_3z = d_3$$

Then sufficient condition is

$$|a_1| > |b_1| + |c_1|$$

$$|b_2| > |a_2| + |c_2|$$

$$|c_3| > |a_3| + |b_3|$$

ie The coefficient of matrix should be diagonally dominant.

7. State the iterative formula for Gauss Jacobi method.

Solution:

$$x = \frac{1}{a_1}(d_1 - b_1y - c_1z)$$

$$y = \frac{1}{b_2}(d_2 - a_2x - c_2z)$$

$$z = \frac{1}{c_3}(d_3 - a_3x - b_3y)$$

with the initial condition $x=y=z=0$.



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8. State the iterative formula for Gauss Seidal method.

Solution:

$$x = \frac{1}{a_1}(d_1 - b_1y - c_1z)$$

$$y = \frac{1}{b_2}(d_2 - a_2x - c_2z)$$

$$z = \frac{1}{c_3}(d_3 - a_3x - b_3y)$$

with the initial condition $y=z=0$.

9. When will iteration method succeed?

Solution:

Iteration method may succeed, the equation of system must contain one large coefficient and it should be along the leading diagonal of the matrix of the coefficient.

10. Whether the given system of equation is solvable using iterative method.

Solution:

$$x + 3y + 52z = 173.61$$

$$41x - 2y + 3z = 65.46$$

$$x - 27y + 2z = 71.31$$

As the sufficient condition is not satisfied by the system of equations [ie the coefficient matrix is not diagonally dominant], we write the equation as,

$$41x - 2y + 3z = 65.46$$

$$x - 27y + 2z = 71.31$$

$$x + 3y + 52z = 173.61$$

Now the diagonal elements are dominant in the coefficient matrix is solvable using iterative method.



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11. Compare Gauss Jacobi and Gauss seidal methods.

Solution:

Gauss Jacobi method	Gauss Seidal method
1)Convergence rate is slow	The rate of convergence of Gauss Seidal method is roughly twice that of Gauss Jacobi.
2)Iterative method	Iterative method
3)Condition for convergence is the coefficient matrix is diagonally dominant	Condition for convergence is the coefficient matrix is diagonally dominant

12. Why Gauss-Seidal method is a better method than Jacobi's iterative method.

Solution:

Since the current value of the unknowns at each stage of iteration are used in proceeding to the next stage of iteration, the convergence in Gauss Seidal method will be more rapid than in Gauss Jacobi method.

13. State the merits and demerits of Elimination and Iterative methods for solving a system of equations.

Solution:

Elimination method involves a certain amount of fixed computation and they are exact solutions.

Iterative method is those in which the solution is got by successive approximations and they are approximate solutions.