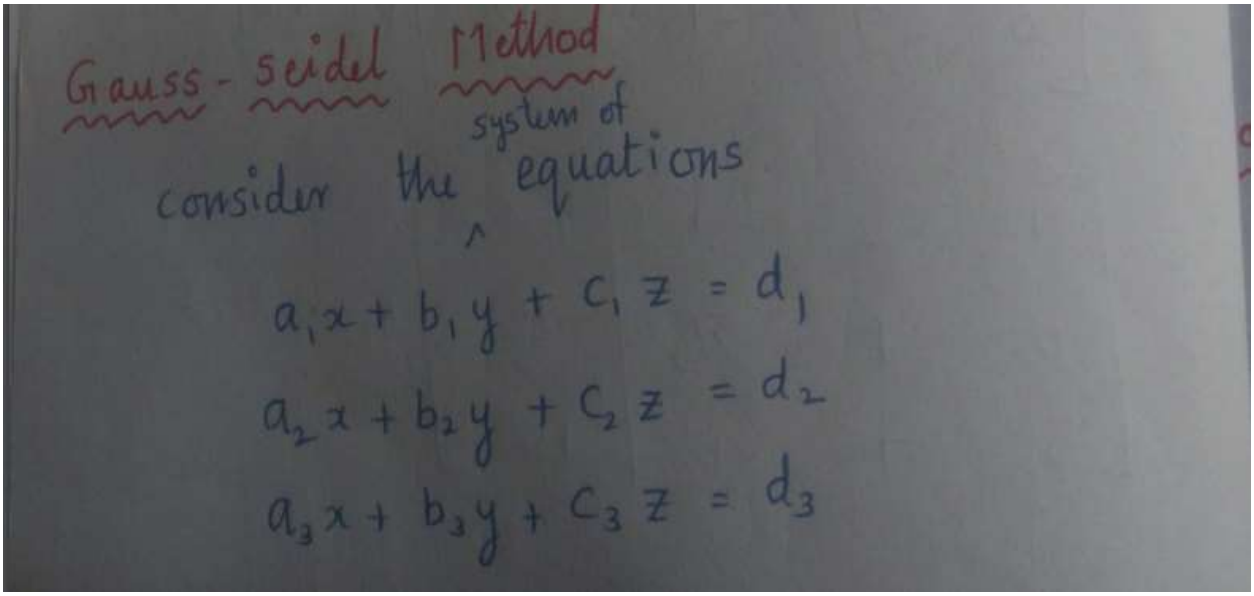
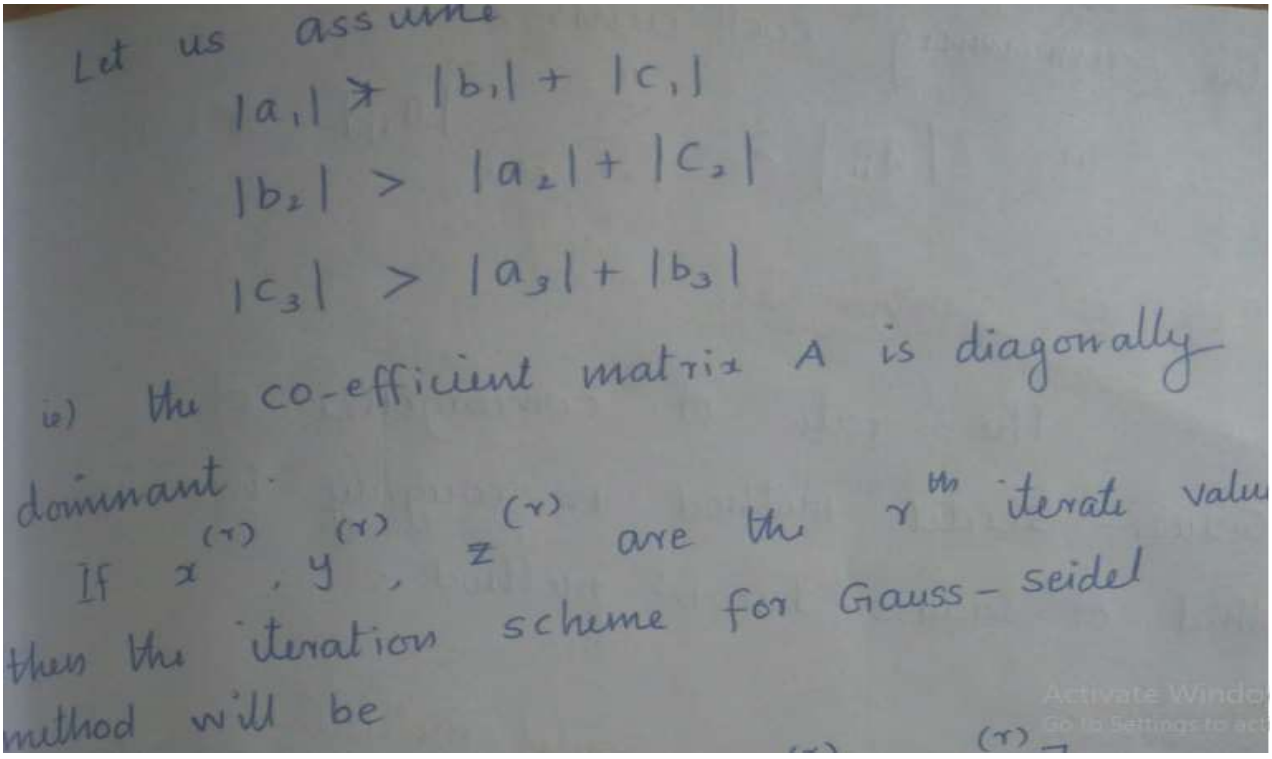
Topic: 3.6 – Gauss Seidal Iterative method





$$x^{(r+1)} = \frac{1}{a_1}\left[d_1 - b_1 y^{(r)} - c_1 z^{(r)}\right]$$

$$y^{(r+1)} = \frac{1}{b_2}\left[d_2 - a_2 x^{(r+1)} - c_2 z^{(r)}\right]$$

$$z^{(r+1)} = \frac{1}{c_3}\left[d_3 - a_3 x^{(r+1)} - b_3 y^{(r+1)}\right]$$

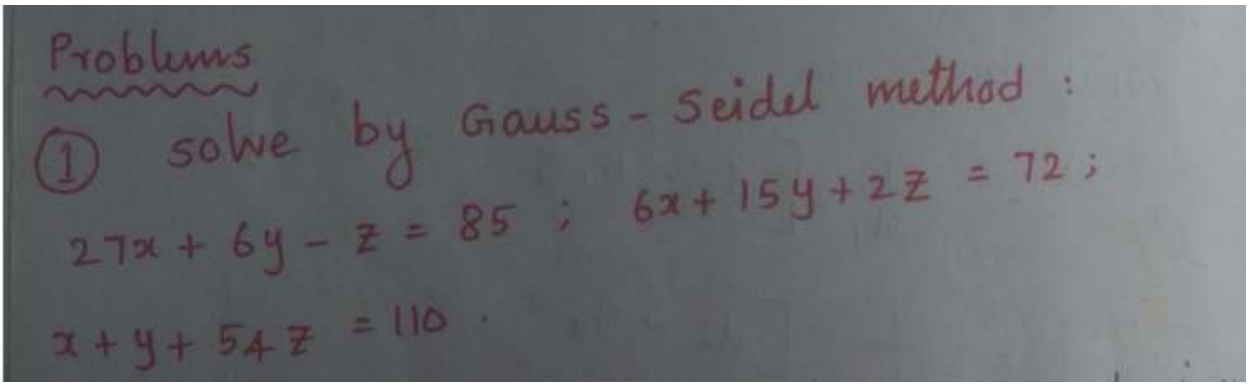
condition for convergence

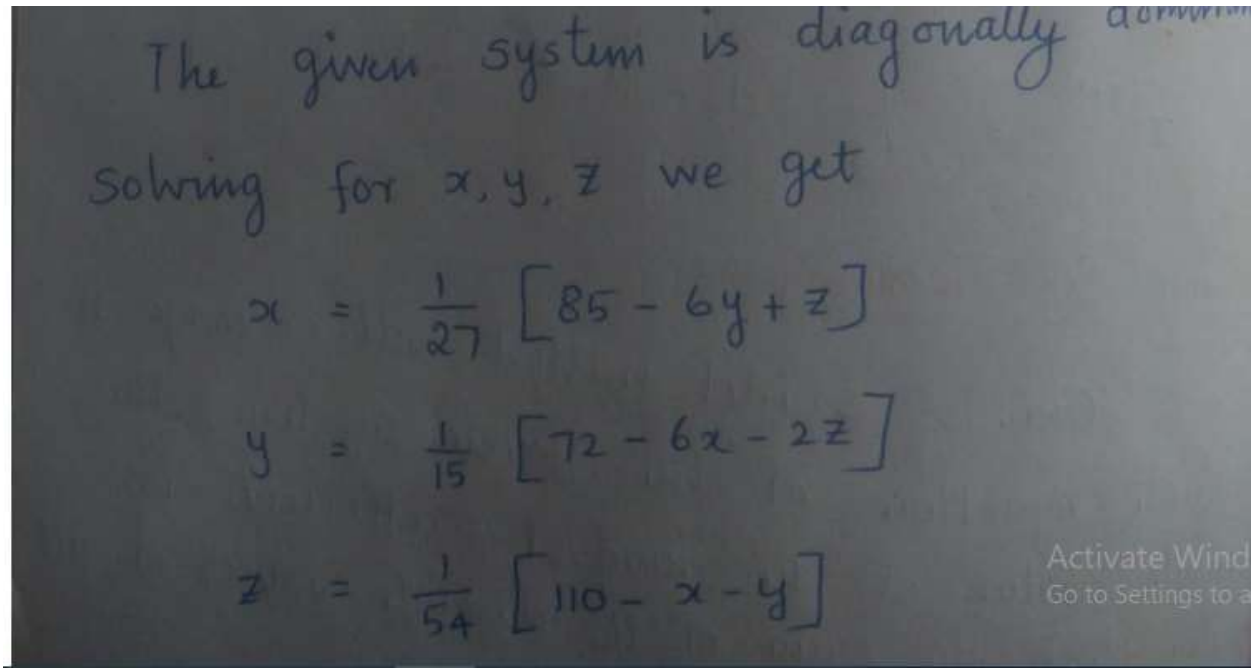
Gauss - seidel method will converge if in each equation of the given system, the absolute value of the largest coefficient is greater than the sum of the absolute values of all the remaining coefficients.

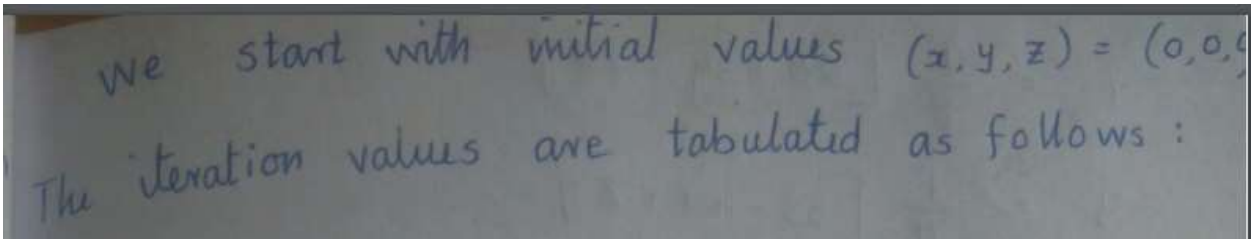
i) $|a_{ii}| > \sum_{j=1, j\neq i}^{n} |a_{ij}| \quad \forall i = 1, 2, \ldots$

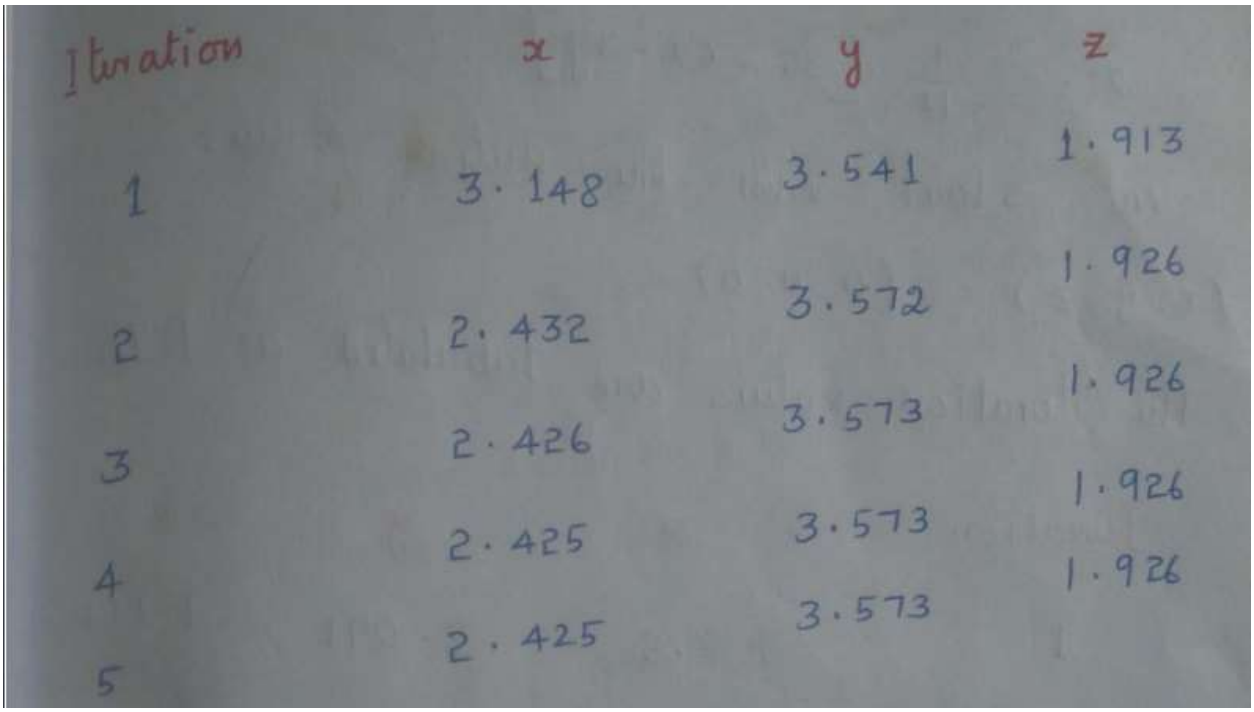
Rate of Convergence

The rate of convergence of Gauss - seidel method is roughly two time that of Gauss - Jacobi method.

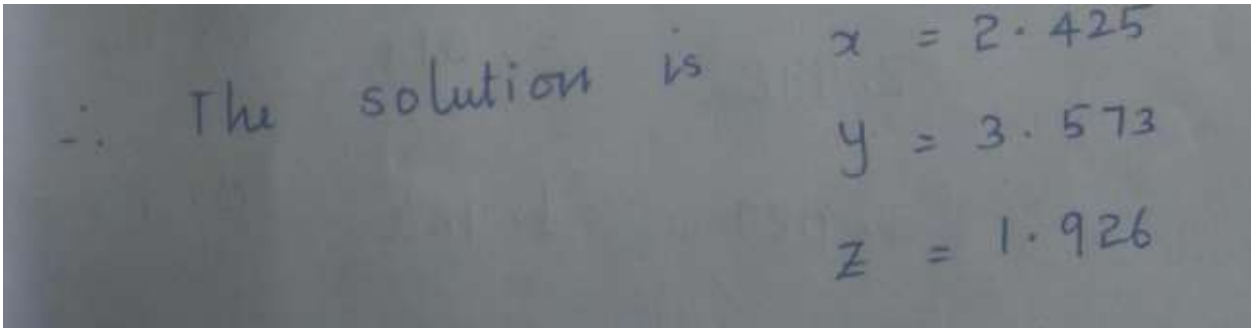

Problems
① solve by Gauss - Seidel method :
27x + 6y - z = 85 ; 6x + 15y + 2z = 72 ;
x + y + 54z = 110 .


The given system is diagonally
Solving for x, y, z we get
x = 1/27 [85 - 6y + z]
y = 1/15 [72 - 6x - 2z]
z = 1/54 [110 - x - y]


we start with initial values (x, y, z) = (0,0,
The iteration values are tabulated as follows :



Iteration	x	y	z
1	3.148	3.541	1.913
2	2.432	3.572	1.926
3	2.426	3.573	1.926
4	2.425	3.573	1.926
5	2.425	3.573	1.926



∴ The solution is $x = 2.425$

$y = 3.573$

$z = 1.926$