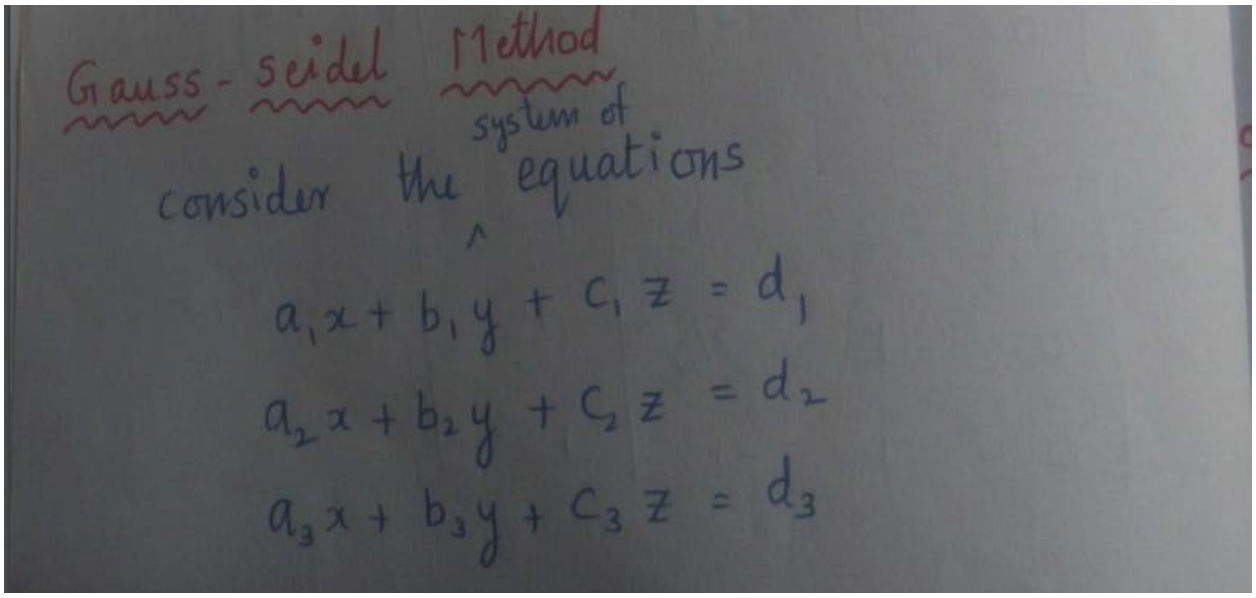
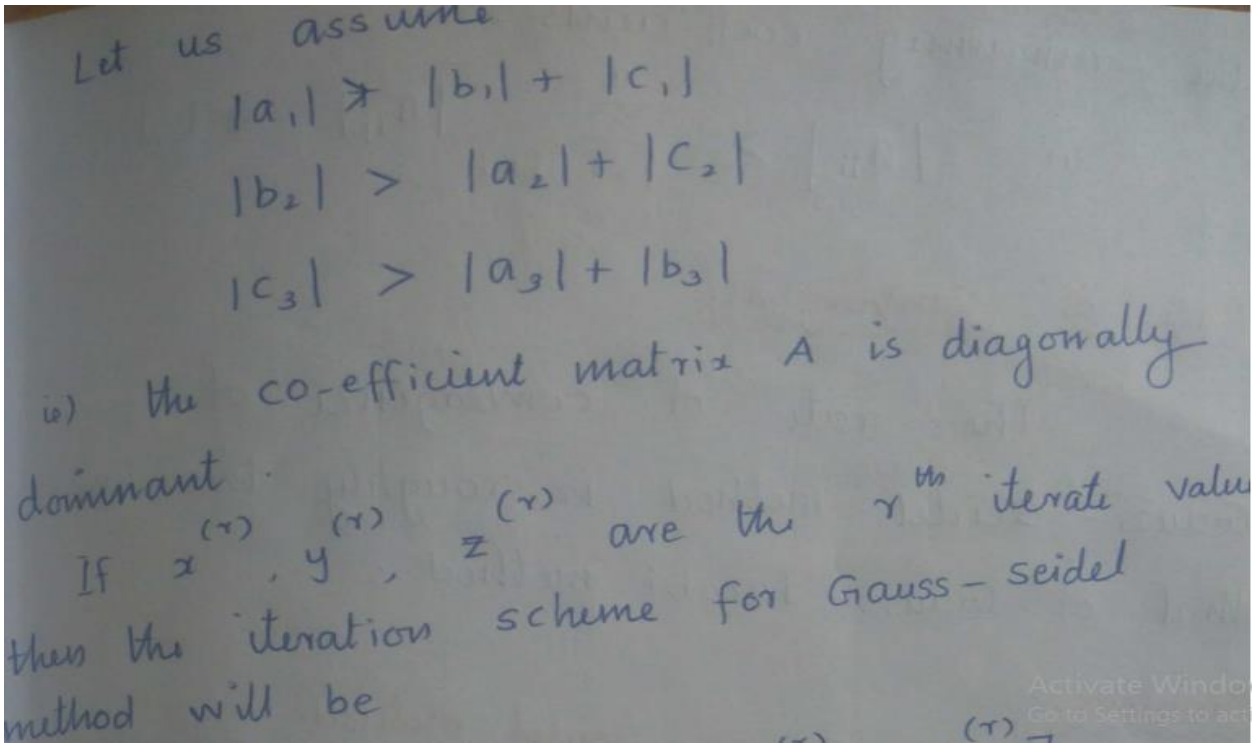

Gauss - seidel Method
consider the system of equations
$a_1x + b_1y + c_1z = d_1$
$a_2x + b_2y + c_2z = d_2$
$a_3x + b_3y + c_3z = d_3$


Let us assume
$|a_1| > |b_1| + |c_1|$
$|b_2| > |a_2| + |c_2|$
$|c_3| > |a_3| + |b_3|$
(i) the co-efficient matrix A is diagonally dominant
If $x^{(r)}, y^{(r)}, z^{(r)}$ are the r^{th} iterate value
then the iteration scheme for Gauss - seidel method will be

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

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

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

Condition for convergence

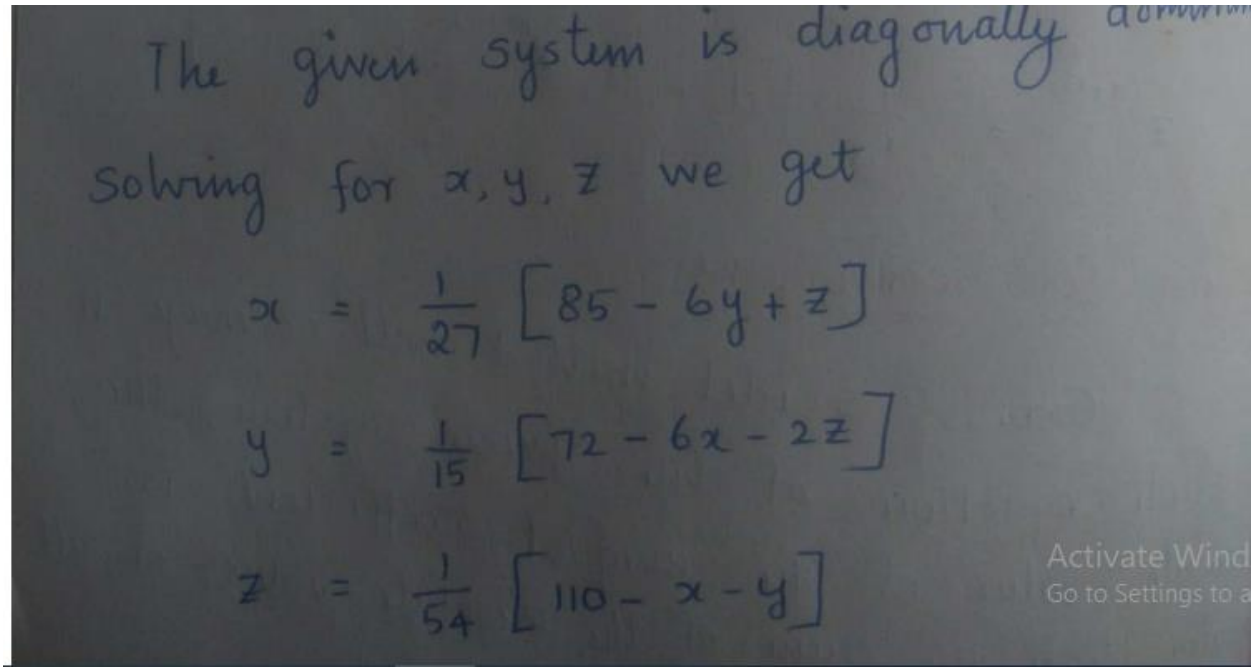
Gauss-seidel method will converge if in each equation of the given system, the absolute value of the largest coefficient is greater than the sum of the absolute values of all

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
$x = \frac{1}{27}[85 - 6y + z]$
$y = \frac{1}{15}[72 - 6x - 2z]$
$z = \frac{1}{54}[110 - x - y]$
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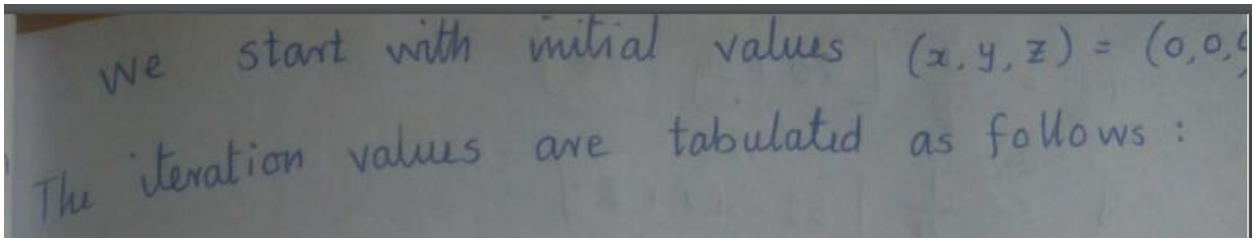
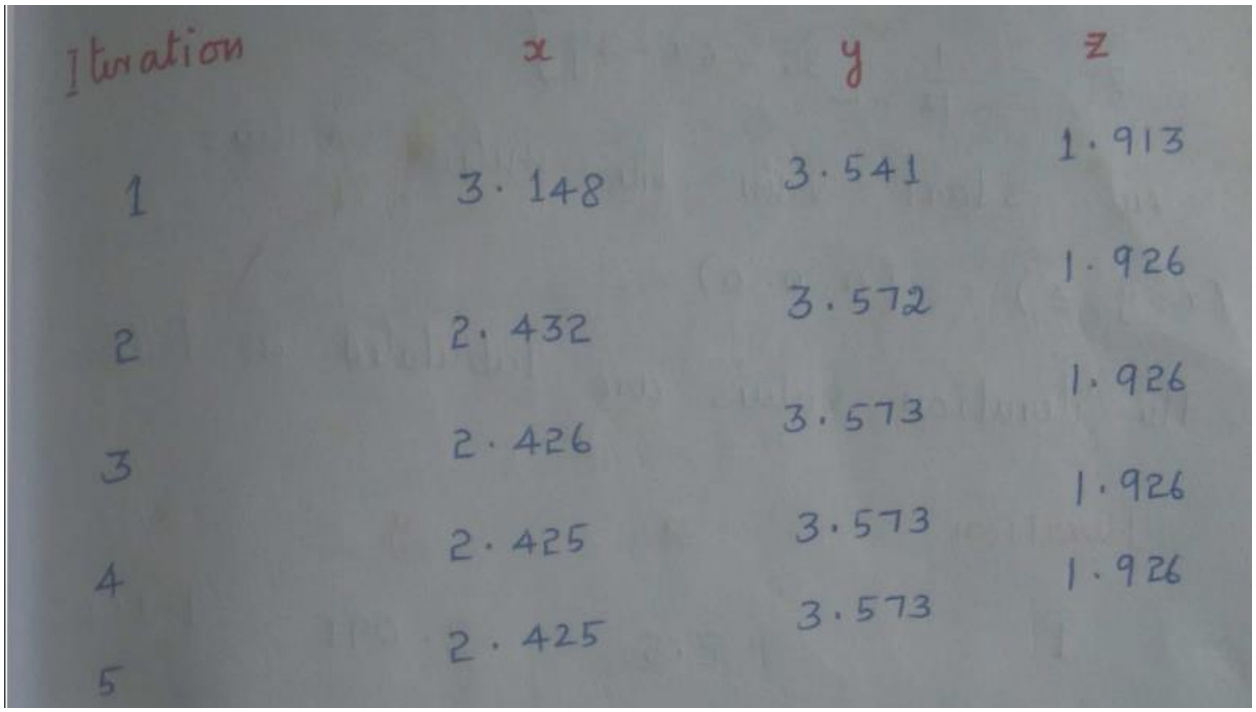
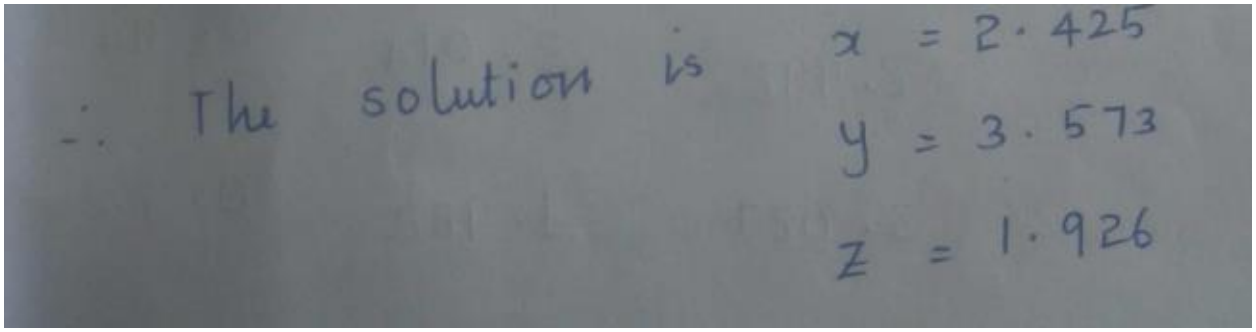
Go to Settings to a


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



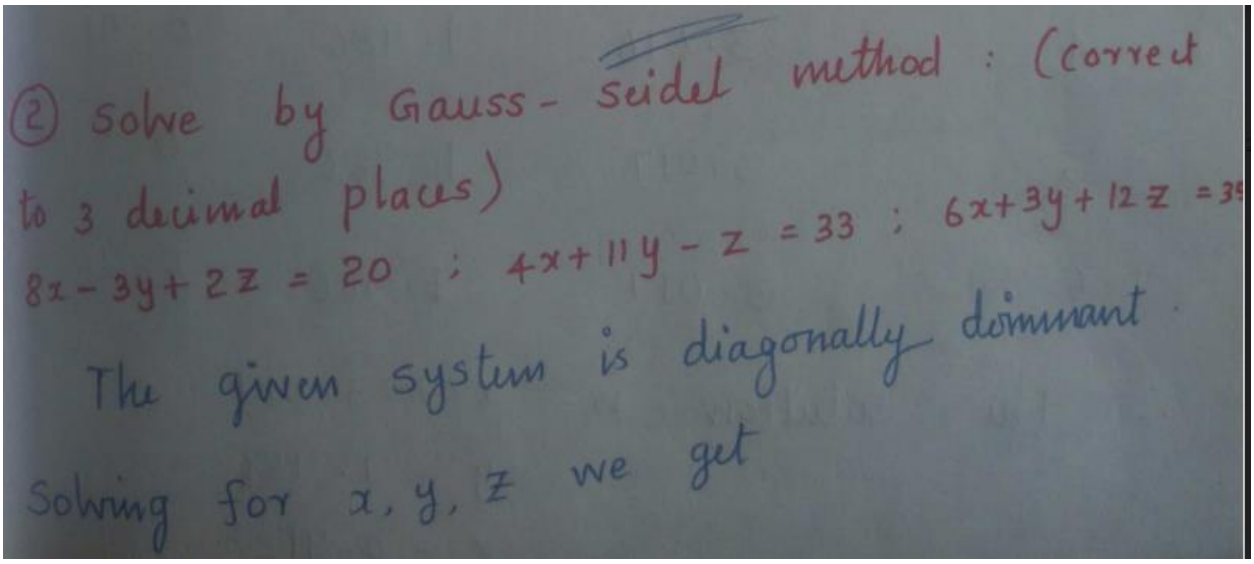
Iteration	x	y	z
1	3.148	3.541	1.913
2	2.432	3.572	1.926
3	2.426	3.573	1.926
4	2.425	3.573	1.926
5	2.425	3.573	

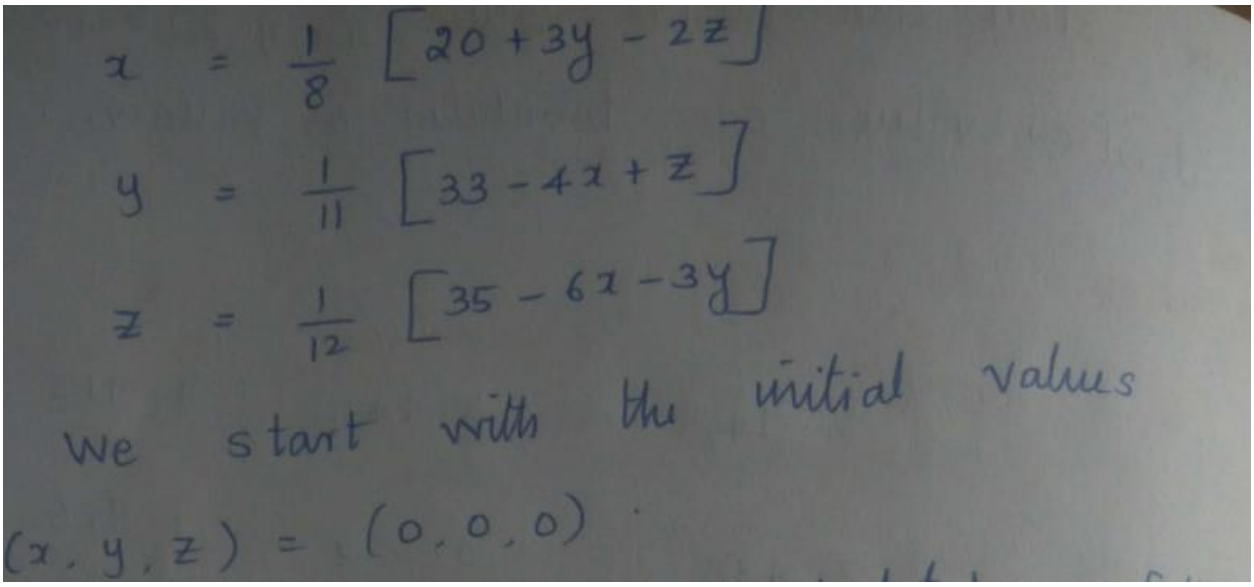


∴ The solution is $x = 2.425$

$y = 3.573$

$z = 1.926$

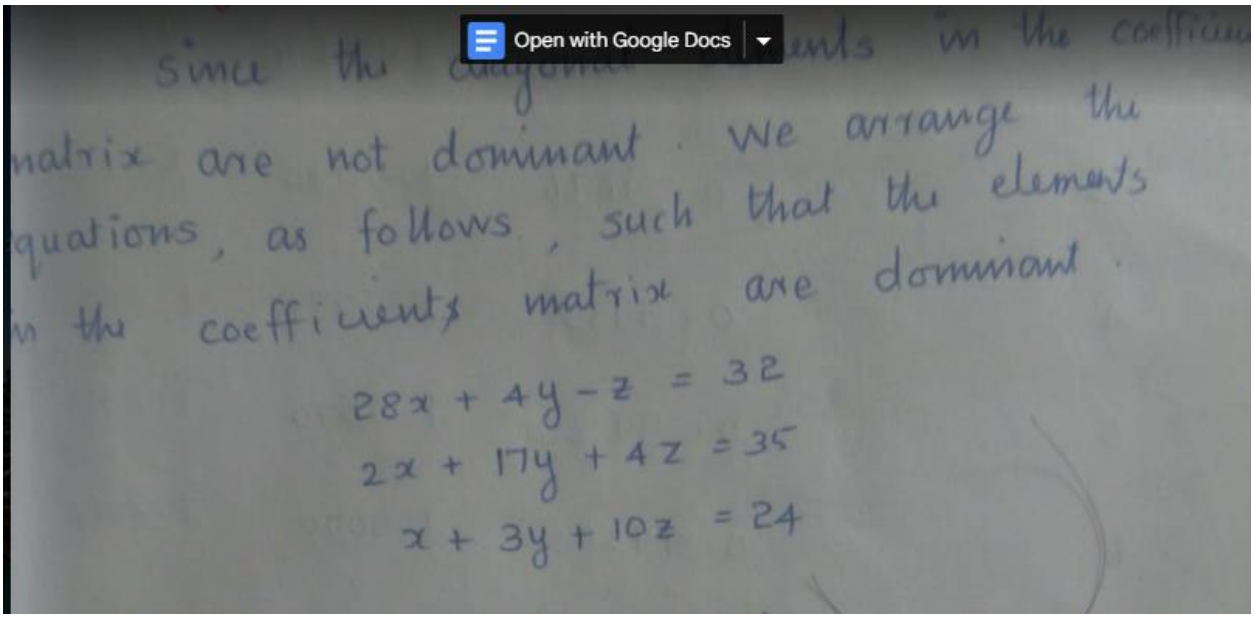

② Solve by Gauss - Seidel method : (correct
to 3 decimal places)
8x - 3y + 2z = 20 ; 4x + 11y - z = 33 ; 6x + 3y + 12z = 35
The given system is diagonally dominant.
Solving for x, y, z we get


$x = \frac{1}{8}[20 + 3y - 2z]$
$y = \frac{1}{11}[33 - 4x + z]$
$z = \frac{1}{12}[35 - 6x - 3y]$
We start with the initial values
$(x, y, z) = (0, 0, 0)$

Iteration	x	y	z
1	2.5	2.091	1.144
2	2.998	2.014	0.914
3	3.027	1.982	0.908
4	3.016	1.986	0.912
5	3.017	1.986	0.912
6	3.017	1.986	0.912

∴ The solution is $x = 3.017$
$y = 1.986$
$z = 0.912$

③ Solve by Gauss-Seidel method:
$28x + 4y - z = 32$; $x + 3y + 10z = 24$;
$2x + 17y + 4z = 35$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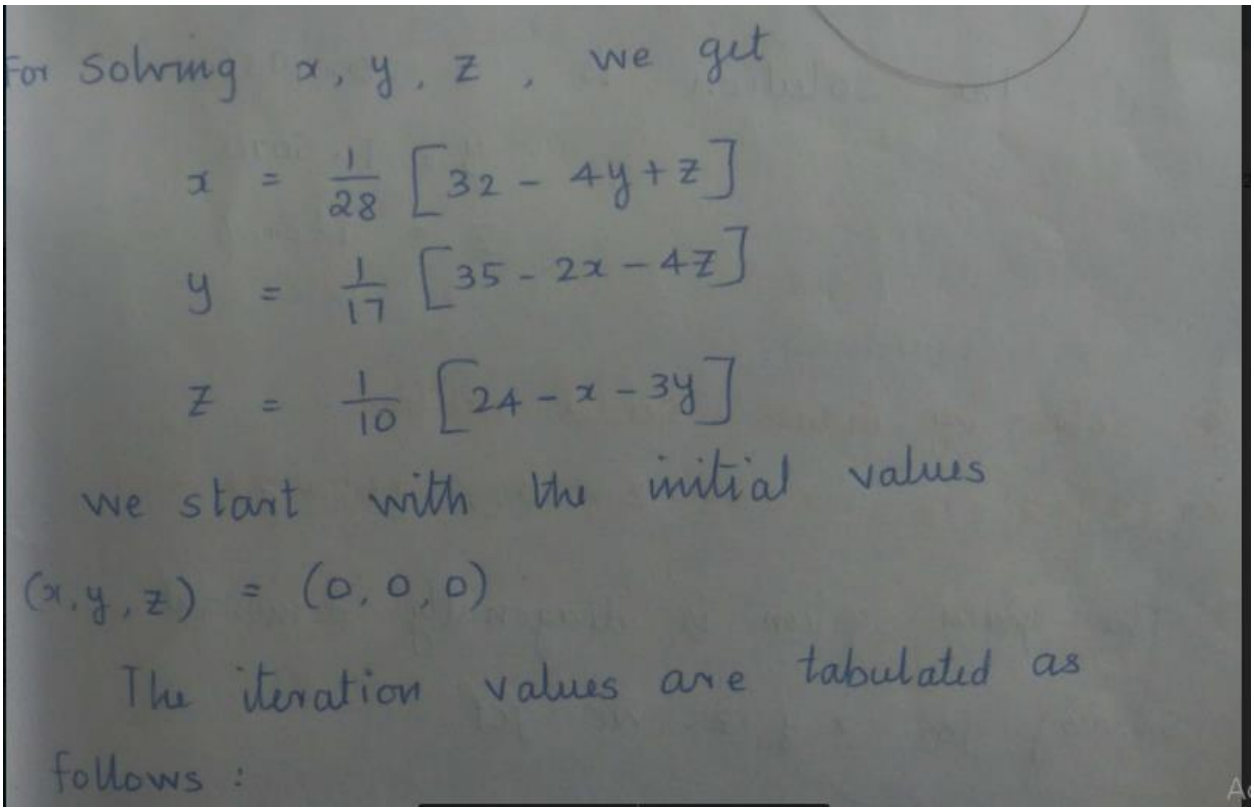
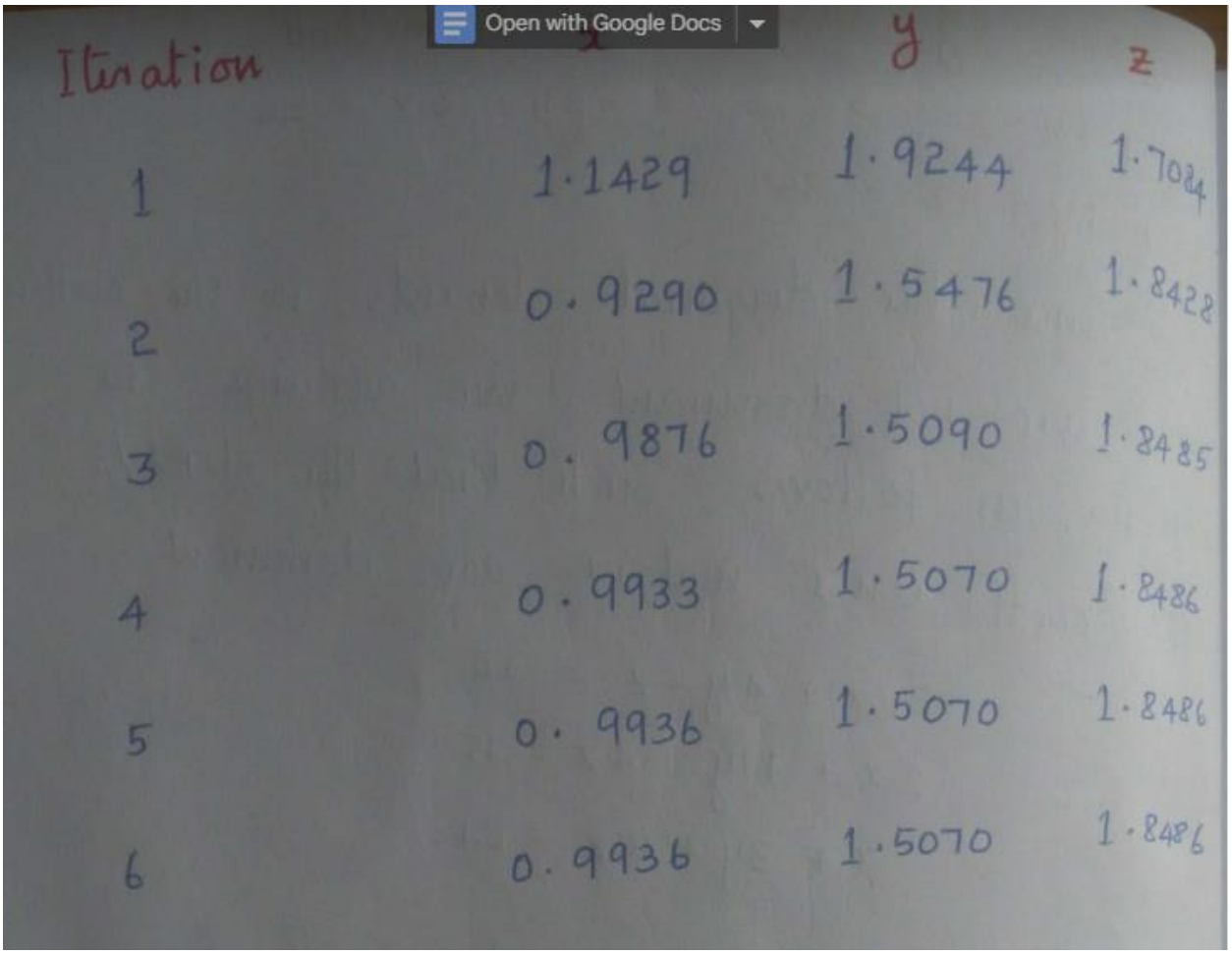
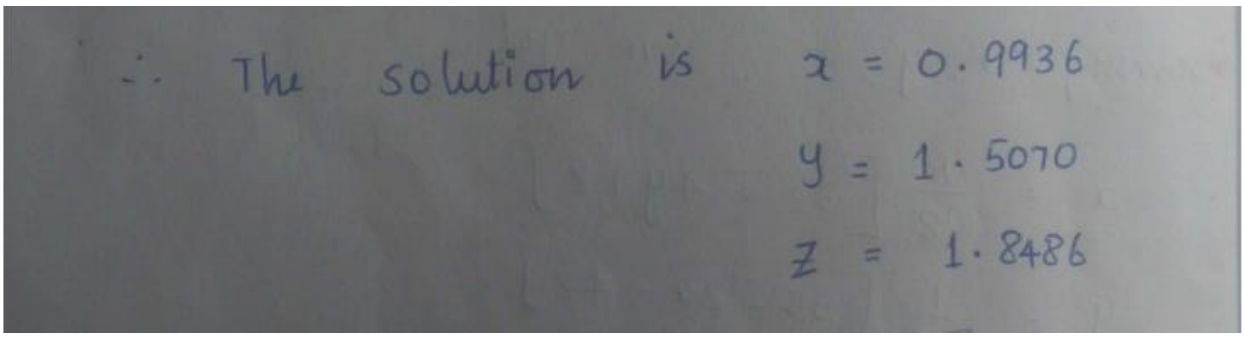
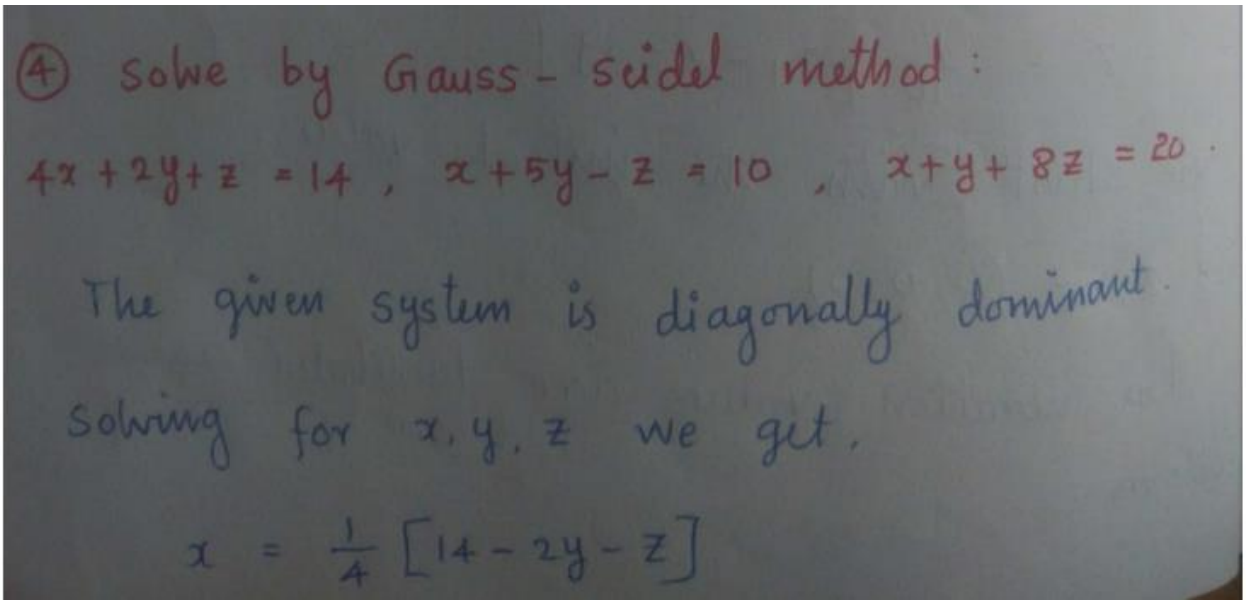
Since the
in the coeffici
matrix are not dominant. We arrange the
equations, as follows, such that the elements
in the coefficients matrix are dominant.
28x + 4y − z = 32
2x + 17y + 4z = 35
x + 3y + 10z = 24


For solving x, y, z, we get
x = 1/28 [32 − 4y + z]
y = 1/17 [35 − 2x − 4z]
z = 1/10 [24 − x − 3y]
we start with the initial values
(x, y, z) = (0, 0, 0)
The iteration values are tabulated as
follows :


Open with Google Docs
Iteration
y
z
1
1·1429
1·9244
1·7034
2
0·9290
1·5476
1·8428
3
0·9876
1·5090
1·8485
4
0·9933
1·5070
1·8486
5
0·9936
1·5070
1·8486
6
0·9936
1·5070
1·8486


∴ The solution is
x = 0·9936
y = 1·5070
z = 1·8486


④ Solve by Gauss - seidel method :
4x + 2y + z = 14 , x + 5y - z = 10 , x + y + 8z = 20 .
The given system is diagonally dominant.
Solving for x, y, z we get,
x = 1/4 [14 - 2y - z]