$-2x+2y+z=3$
$x+2y-3z=8$

Gauss seidal Iterative Method:-

working Rule

Step-I consider the system of linear eq^n's

$$a_1x+b_1y+c_1z=d_1$$
$$a_2x+b_2y+c_2z=d_2$$
$$a_3x+b_3y+c_3z=d_3$$

Step-II Solve given equation for x, y, z

$$x=\frac{1}{a_1}\left[d_1-b_1y-c_1z\right] \quad (1)$$

$$y=\frac{1}{b_2}\left[d_2-a_2x-c_2z\right] \quad (2)$$

$$z=\frac{1}{c_3}\left[d_3-a_3x-b_3y\right] \quad (3)$$

Step-III

1) first approximation.

put $y=z=0$ into eq^n ① and find $x=x_1$

put $x=x_1$ $z=0$ into eq^n ② and find $y=y_1$

put $x=x_1$ $y=y_1$ into eq^n 3 and find $z=z_1$

2) 2^nd approximation

put $y=y_1$ and $z=z_1$ into eq^n ① and find $x=x_2$

put $x=x_2$ $z=z_1$ into eq^n ② and find $y=y_2$

put $x=x_2$ $y=y_2$ into eq^n ③ and find $z=z_2$

~~3rd approximation.~~

~~put~~

Repeat above steps until the required solution.

3rd approximation

put $y=y_2$ and $z=z_2$ into eq^n ① and find $x=x_3$

put $x=x_3$ $z=z_2$ into eq^n ② and find $y=y_3$

put $x=x_3$, $y=y_3$ into eq^n ③ and find $z=z_3$

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Q: Solve by Gauss seidal method

$$83x + 11y - 4z = 95$$
$$7x + 52y + 13z = 104$$
$$3x + 8y + 29z = 71$$

Sol^n given

solving given eq^n for x, y, z

$$x = \frac{1}{83}\left[95 - 11y - 4z\right] \quad (1)$$

$$y = \frac{1}{52}\left[104 - 7x - 13z\right] \quad (2)$$

$$z = \frac{1}{29}\left[71 - 3x - 8y\right] \quad (3)$$

1st approximation.

put $y = z = 0$ eq^n (1)

$$x = \frac{1}{83}\left[95\right] = 95/83 = 1.145$$

put $x = x_1 =$ $$y = \frac{1}{52}\left[104 - 7(1.145) - 13(0)\right]$$

$$= \frac{1}{52}\left[104 - 9.1737\right]$$

$$= \frac{94.826}{52} = 1.8235 = 1.846$$

put $x = 1.145$ $y = 1.846$ into eq^n (3)

$$z = \frac{1}{29}\left[71 - 3(1.145) - 8(1.846)\right] = 1.821$$

2nd approximation.

put $y = 1.846$ and $z = 1.821$ into eq^n ①

$$\therefore x = \frac{1}{83}\left[95 - 11(1.846) + 4(1.821)\right]$$

$$x = 0.988$$

put $x = 0.988$ and $z = 1.821$ into eq^n ②

$$y = \frac{1}{52}\left[104 - 7(0.988) - 13(1.821)\right] = 1.412$$

put $x = 0.988$ $y = 1.412$ into eq^n ③

$$z = \frac{1}{29}\left[71 - 3(0.988) - 8(1.412)\right] = 1.956$$

3rd approximation.

put ~~x = 0.988~~ ~~and~~ $y = 1.412$ and $z = 1.956$ into eq^n ①

$$x = \frac{1}{83}\left[95 - 11(1.412) + 4(1.956)\right] = 1.051$$

put $x = 1.051$ $z = 1.956$ into eq^n ②

$$y = \frac{1}{52}\left[104 - 7(1.051) - 13(1.956)\right] = 1.369$$

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put $x = 1.051$ and $y = 1.344$ into eqn ③ we get

$$z = \frac{1}{29}\left[71 - 3(1.051) - 8(1.344)\right] = 1.962$$

4th approximation

put $y = 1.344$ and $z = 1.969$ into eqn ①

$$x = \frac{1}{83}\left[95 - 11(1.344) + 4(1.969)\right]$$

$$\boxed{x = 1.051}$$

put $x = 1.051$ and $z = 1.969$ into eqn ② we get

$$y = \frac{1}{\cancel{83}\ 52}\left[104 - 7(1.051) - 13(1.969)\right]$$

$$\boxed{y = 1.344}$$

put $x = 1.051$ $y = 1.344$ into eqn ③ we get

$$z = \frac{1}{29}\left[71 - 3(1.051) - 8(1.344)\right]$$

$$\boxed{z = 1.969}$$

Hence, ap required approximate solⁿ upto 3 decimal places $x = 1.051$, $y = 1.344$ & $z = 1.969$ Ans