

For the given linear system:

$$6x - 3y + z = 11$$

$$2x + y - 8z = -15$$

$$x - 7y + z = 10$$

**Solution:**

**Step-01**

Make sure that the diagonal entries are maximum otherwise alter the equations;

$$6x - 3y + z = 11$$

$$x - 7y + z = 10$$

$$2x + y - 8z = -15$$

**Step-02**

Transform all LHS to RHS such that the diagonal entries are maximum i.e.

$$0 = 11 - 6x - 3y + z$$

$$0 = 10 - x - 7y + z$$

$$0 = -15 - 2x + y - 8z$$

**Step-03**

Take the initial guess:  $x = y = z = 0$ , then we get:

$$R_1 = 11, R_2 = 10, \text{ and } R_3 = -15$$

**Step-04**

Identify the largest the residual's magnitude.

$$\text{Here } |R_3| = |-15| = 15$$

**Step-05**

Find the increment  $dx_3$  in  $x_3$  corresponding to  $R_3$  i.e.

$$dx_3 = -\frac{|R_3|}{a_{33}} = -\frac{|-15|}{-8} = 1.875$$

**Step-06**

Now the new guess will be

$x = y = 0$  and  $z = 1.875$  and proceed so that  $R \rightarrow 0$ .