

```

In[39]:= (* Given equation coefficients *)
A = {{2, -6, -1}, {-3, -1, 7}, {-8, 1, -2}};
B = {-38, -34, -20};
M = Join[A, Transpose[{B}], 2]; (* Augmented matrix *)

n = MatrixRank[M];
m = Length[A];
If[m ≠ n, (* If rank is less than the number of rows, infinite solution possible *)
  Print["Infinite solution possible"]]

For[k = 1, k < n, k++,
  max = 0;
  index = 0;

  (* Find index of column with max value *)
  For[j = k, j ≤ n, j++,
    If[Abs[M[[j, k]]] > max,
      max = Abs[M[[j, k]]];
      index = j;
    ]
  ]

  (* Swap rows if index is not k *)
  If[index ≠ k,
    Print["No change in order of rows"],
    Print["Row " <> ToString[k] <> " and " <> ToString[index] <> " swapped"];
    temp = M[[index]];
    M[[index]] = M[[k]];
    M[[k]] = temp;
  ]

  (* Gaussian elimination *)
  For[i = k + 1, i ≤ n, i++,
    fact = M[[i, k]] / M[[k, k]];

    For[j = k, j ≤ n + 1, j++,
      M[[i, j]] = M[[i, j]] - fact * M[[k, j]];
    ]
  ]

  Print["Augmented Matrix after step " <> ToString[k]];

```

```

Print[MatrixForm[M]]
]

(* Backward substitution *)
x = ConstantArray[0, n];
x = Transpose[{x}]; (* x is a column vector containing n rows *)
x[[n]] = M[[n, n + 1]] / M[[n, n]];
i = n - 1;
While[i > 0,
  x[[i]] = (M[[i, n + 1]] - Sum[M[[i, j]] * x[[j]], {j, i + 1, n}]) / M[[i, i]];
  i--;
]

Print["Solution of the above equation is"];
MatrixForm[x]

```

Row 1 and 3 swapped

Augmented Matrix after step 1

$$\begin{pmatrix} -8 & 1 & -2 & -20 \\ 0 & -\frac{11}{8} & \frac{31}{4} & -\frac{53}{2} \\ 0 & -\frac{23}{4} & -\frac{3}{2} & -43 \end{pmatrix}$$

Row 2 and 3 swapped

Augmented Matrix after step 2

$$\begin{pmatrix} -8 & 1 & -2 & -20 \\ 0 & -\frac{23}{4} & -\frac{3}{2} & -43 \\ 0 & -\frac{11}{8} & \frac{31}{4} & -\frac{53}{2} \end{pmatrix}$$

Solution of the above equation is

Out[52]//MatrixForm=

$$\begin{pmatrix} 4 \\ 8 \\ -2 \end{pmatrix}$$