

## Step-1

Given system is  $ax + 3y = -3$

$$4x + 6y = 6$$

Given system can be written as

$$\begin{pmatrix} a & 3 & -3 \\ 4 & 6 & 6 \end{pmatrix}$$

## Step-2

(a)

Subtract  $\frac{4}{a}$  times the first row from  $a$  times the second row

$$\begin{pmatrix} a & 3 & -3 \\ 0 & 6a-12 & 6a-12 \end{pmatrix}$$

If  $6a-12=0$  i.e.  $a=2$ , then we cannot proceed for the elimination.

Hence, the system has no solution.

Therefore the elimination breaks down permanently when  $a=2$ .

## Step-3

(b)

If  $a=0$ , then

$$\begin{pmatrix} a & 3 & -3 \\ 4 & 6 & 6 \end{pmatrix} = \begin{pmatrix} 0 & 3 & -3 \\ 4 & 6 & 6 \end{pmatrix}$$

If we exchange the rows then only we can proceed for the elimination.

$$\text{So we have } \begin{pmatrix} 4 & 6 & 6 \\ 0 & 3 & -3 \end{pmatrix}$$

By back ward substitution, we have

$$3y = -3$$

$$\Rightarrow \boxed{y = -1}$$

And  $4x + 6y = 6$

$$\Rightarrow 4x - 6 = 6$$

$$\Rightarrow 4x = 12$$

$$\Rightarrow \boxed{x = 3}$$

So if  $a = 0$ , elimination stops for a row exchange and the solution is  $(3, -1)$ .