Step-1

The columns of the matrix A are: $\begin{bmatrix}1\\0\end{bmatrix}$ and $\begin{bmatrix}1\\1\end{bmatrix}$.

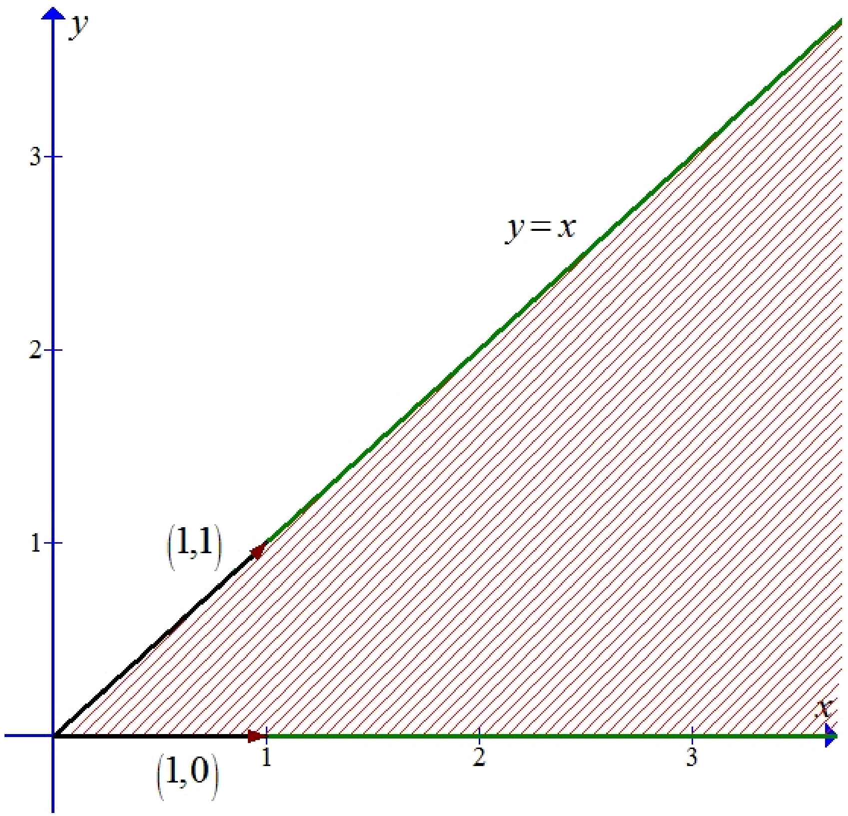
Thus, the nonnegative combinations of the columns of the matrix A is given by

$$\alpha\begin{bmatrix}1\\0\end{bmatrix}+\beta\begin{bmatrix}1\\1\end{bmatrix}$$

Here, $\alpha \ge 0$ and $\beta \ge 0$.

Step-2

The vector $\begin{bmatrix}1\\0\end{bmatrix}$ is along the x-axis and the vector $\begin{bmatrix}1\\1\end{bmatrix}$ makes the angle of 45Â° with the positive direction of x-axis. Thus, the space is the region in the first quadrant between the x-axis and the line $y = x$. The region is as drawn below:



Step-3

Consider the vector $b=(3,2)$, which lies inside the space.

Let $Ax=b$, where $x=(x_1,x_2)$. Then we have

$$\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}=\begin{bmatrix} 3 \\ 2 \end{bmatrix}$$

$$\begin{bmatrix} x_1+x_2 \\ x_2 \end{bmatrix}=\begin{bmatrix} 3 \\ 2 \end{bmatrix}$$

Therefore, $x_2=2$ and this implies that $x_1=1$.

Therefore, $\boxed{\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}=\begin{bmatrix} 1 \\ 2 \end{bmatrix}}$.

Step-4

Suppose $b=(0,1)$. Let us write, $Ax=b$. This gives,

$$\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} y_1 \\ y_2 \end{bmatrix}=\begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} y_1+y_2 \\ y_2 \end{bmatrix}=\begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

Therefore, $y_2=1$ and this implies that $y_1=-1$.

Therefore, $\boxed{\begin{bmatrix} y_1 \\ y_2 \end{bmatrix}=\begin{bmatrix} 1 \\ -1 \end{bmatrix}}$.