

## Step-1

(a)

If,

$$\begin{aligned}x_1 &= x_2 \\ &= x_3 \\ &= x_4 \\ &= 0\end{aligned}$$

Then S is spanned by  $(0, 0, 0, 0)$ .

The dimension of  $\boxed{S=0}$ .

## Step-2

(b)

If  $x_1 \neq 0$  and

$$\begin{aligned}x_2 &= x_3 \\ &= x_4 \\ &= 0\end{aligned}$$

Then S is spanned by  $(x_1, 0, 0, 0) = \{(x_1, 0, 0, 0) / x_1 \in R\}$

The dimension of  $\boxed{S=1}$ .

## Step-3

(c)

If,

$$\begin{aligned}v_1 &= (1, 0, 0, 0) \\ v_2 &= (0, 1, 0, 0) \\ v_3 &= (0, 0, 1, 0)\end{aligned}$$

$v_1, v_2, v_3$  Are linearly independent

S is spanned by  $v_1, v_2, v_3$  then dimension of  $\boxed{S=3}$ .

## Step-4

(d)

$$v_1 = (1, 0, 0, 0)$$

$$v_2 = (0, 1, 0, 0)$$

$$v_3 = (0, 0, 1, 0)$$

$$v_4 = (0, 0, 0, 1),$$

If  $S$  is spanned by  $\{v_1, v_2, v_3, v_4\}$  then dimension of  $\boxed{S = 4}$ .