

## Step-1

Let us consider the linear programming problem with  $A$  as the identity matrix and the vectors  $b$  and  $c$  are nonnegative.

Therefore, we can write the primal of the problem as follows.

Minimize:  $cx$

Subject to  $x \leq b$

And the corresponding dual of the problem is as follows.

Maximize:  $by$

Subject to  $y \leq c$

## Step-2

Solving the primal and the dual of the problem, we get the following results.

$$x^* = b$$

$$y^* = c$$

Therefore, the corresponding cost of primal and its dual is  $bc$

## Step-3

Now, according to the property, if the vectors  $x$  and  $y$  are feasible and  $cx = yb$ , then  $x$  and  $y$  are optimal.

## Step-4

Now, if the first component of  $b$  is negative, then the optimal value of  $x$  and  $y$  are changed as shown below

$$\begin{array}{l} x^* = (0, b_2, \dots, b_n) \\ y^* = (0, c_2, \dots, c_n) \end{array}$$