Step-1

Identity Transformation: When the outputs of linear transformation $T(v_j) = v_j$ are combinations of $\sum_{i=1}^{n} m_{ij} w_i$ then the change of basis matrix is *M*. Matrix *M* represents the identity transformation.

Step-2

Consider an identity transformation that takes each vector to itself.

$Tx = x$

Let the first basis is:

$v_1 = (1,2)$
$v_2 = (3,4)$

Second basis is:

$w_1 = (1,0)$
$w_2 = (0,1)$

This basis does not represent an identity matrix. Find the corresponding matrix that represents the identity transformation.

Step-3

The input basis are $v_1 = (1,2)$ and $v_2 = (3,4)$. In the identity transformation first input is the output itself. So, output can be expressed as $1w_1 + 2w_2$. Hence, the first column of the matrix *M* contains 1 and 2.

Similarly, second column will contain 3 and 4.

Step-4

Therefore the matrix *M* is :

$$\boxed{M = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}}$$