

Step-1

With weighting matrix $W = \begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix}$, we have to find the W -inner product of $(1,0)$ with $(0,1)$.

Given

$$W = \begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix}$$

$$x = (1, 0)$$

$$y = (0, 1)$$

Step-2

We know that W -inner product of x with y is

$$= (x, y)_W$$

$$= (Wy)^T (Wx)$$

Step-3

Now

$$Wx = \begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$= \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

$$Wy = \begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

Step-4

$$(Wy)^T = [1 \quad 0]$$

$$(Wy)^T (Wx) = [1 \quad 0] \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

$$= 2 + 0$$

$$= 2$$

Therefore W -inner product of $(1,0)$ with $(0,1)$ is 2