

SECTION 1.3

NUMBER 19

1.3.19

Consider the row and column vectors

$$\vec{x} = [-2, 3, -1] \text{ and } \vec{y} = \begin{bmatrix} 4 \\ -1 \\ 3 \end{bmatrix}.$$

Compute the matrix products $\vec{x}\vec{y}$ and $\vec{y}\vec{x}$.Solution

Well, \vec{x} is 1×3 and \vec{y} is 3×1 , so $\vec{x}\vec{y}$ exists (because of the 3's) and $\vec{y}\vec{x}$ exists (because of the 1's). Notice that $\vec{x}\vec{y}$ is a 1×1 matrix and $\vec{y}\vec{x}$ is a 3×3 matrix! We have

$$\vec{x}\vec{y} = [-2, 3, -1] \begin{bmatrix} 4 \\ -1 \\ 3 \end{bmatrix} = [(-2)(4) + (3)(-1) + (-1)(3)] = \boxed{[-14]} \text{ and}$$

$$\vec{y}\vec{x} = \begin{bmatrix} 4 \\ -1 \\ 3 \end{bmatrix} [-2, 3, -1] = \begin{bmatrix} -8 & 12 & -4 \\ 2 & -3 & 1 \\ -6 & 9 & -3 \end{bmatrix} \quad \square$$