

Change of Basis Exercises

(1) Transform the vector $\begin{bmatrix} 8 \\ 9 \end{bmatrix}$ to the basis $\left(\frac{1}{\sqrt{2}} \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \frac{1}{\sqrt{2}} \begin{bmatrix} 1 \\ -1 \end{bmatrix} \right)$

(2) Transform the vector $\begin{bmatrix} 1 \\ 5 \end{bmatrix}$ to the basis $\left(\frac{1}{\sqrt{2}} \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \frac{1}{\sqrt{2}} \begin{bmatrix} 1 \\ -1 \end{bmatrix} \right)$

(3) Transform the vector $\begin{bmatrix} 5 \\ 3 \end{bmatrix}$ to the basis $\left(\frac{1}{\sqrt{5}} \begin{bmatrix} 2 \\ 1 \end{bmatrix}, \frac{1}{\sqrt{5}} \begin{bmatrix} -1 \\ 2 \end{bmatrix} \right)$

(4) Transform the vector $\begin{bmatrix} 4 \\ 6 \end{bmatrix}$ to the basis $\left(\frac{1}{\sqrt{5}} \begin{bmatrix} 2 \\ 1 \end{bmatrix}, \frac{1}{\sqrt{5}} \begin{bmatrix} -1 \\ 2 \end{bmatrix} \right)$

(5) Transform the vector $\begin{bmatrix} 4 \\ 3 \end{bmatrix}$ to the basis $\left(\frac{1}{\sqrt{5}} \begin{bmatrix} 2 \\ 1 \end{bmatrix}, \frac{1}{\sqrt{5}} \begin{bmatrix} -1 \\ 2 \end{bmatrix} \right)$

(6) Transform the vector $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$ to the basis $\left(\frac{1}{\sqrt{5}} \begin{bmatrix} 2 \\ 1 \end{bmatrix}, \frac{1}{\sqrt{5}} \begin{bmatrix} -1 \\ 2 \end{bmatrix} \right)$

(7) Transform the vector $\begin{bmatrix} 9 \\ 6 \end{bmatrix}$ to the basis $\left(\frac{1}{\sqrt{2}} \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \frac{1}{\sqrt{2}} \begin{bmatrix} 1 \\ -1 \end{bmatrix} \right)$

(8) Transform the vector $\begin{bmatrix} 9 \\ 6 \end{bmatrix}$ to the basis $\left(\frac{1}{\sqrt{5}} \begin{bmatrix} 2 \\ 1 \end{bmatrix}, \frac{1}{\sqrt{5}} \begin{bmatrix} -1 \\ 2 \end{bmatrix} \right)$

(9) Transform the vector $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$ to the basis $\left(\frac{1}{\sqrt{2}} \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \frac{1}{\sqrt{2}} \begin{bmatrix} 1 \\ -1 \end{bmatrix} \right)$

(10) Transform the vector $\begin{bmatrix} 4 \\ 3 \end{bmatrix}$ to the basis $\left(\frac{1}{\sqrt{5}} \begin{bmatrix} 2 \\ 1 \end{bmatrix}, \frac{1}{\sqrt{5}} \begin{bmatrix} -1 \\ 2 \end{bmatrix} \right)$

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$$(1) \frac{1}{\sqrt{2}} \begin{bmatrix} 17 \\ -1 \end{bmatrix}$$

$$(2) \frac{1}{\sqrt{2}} \begin{bmatrix} 6 \\ -4 \end{bmatrix}$$

$$(3) \frac{1}{\sqrt{5}} \begin{bmatrix} 13 \\ 1 \end{bmatrix}$$

$$(4) \frac{1}{\sqrt{5}} \begin{bmatrix} 14 \\ 8 \end{bmatrix}$$

$$(5) \frac{1}{\sqrt{5}} \begin{bmatrix} 11 \\ 2 \end{bmatrix}$$

$$(6) \frac{1}{\sqrt{5}} \begin{bmatrix} 5 \\ 0 \end{bmatrix}$$

$$(7) \frac{1}{\sqrt{2}} \begin{bmatrix} 15 \\ 3 \end{bmatrix}$$

$$(8) \frac{1}{\sqrt{5}} \begin{bmatrix} 24 \\ 3 \end{bmatrix}$$

$$(9) \frac{1}{\sqrt{2}} \begin{bmatrix} 3 \\ 1 \end{bmatrix}$$

$$(10) \frac{1}{\sqrt{5}} \begin{bmatrix} 11 \\ 2 \end{bmatrix}$$