

1. Determine the component vector $\left[\overrightarrow{v}\right]_B$, $\left[p(x)\right]_B$ or $\left[A\right]_B$ of the following:

a) $V = R^3$; $B = \left\{ \begin{bmatrix} 3 \\ -1 \\ -1 \end{bmatrix}, \begin{bmatrix} 1 \\ -6 \\ 3 \end{bmatrix}, \begin{bmatrix} 0 \\ 5 \\ -1 \end{bmatrix} \right\}$ and $\overrightarrow{v} = \begin{bmatrix} 1 \\ 7 \\ 7 \end{bmatrix}$

b) $V = P_2$; $B = \{x^2 + x, 2 + 2x, 1\}$ and $p(x) = 6 + 2x - 4x^2$

c) $V = P_3; B = \{x^3 + x^2, x^3 - 1, x^3 + 1, x^3 + x\}$ and $p(x) = 8 + x + 6x^2 + 9x^3$

d) $V = M_2(R); \text{and } B = \left\{ \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix} \right\}$ and $A = \begin{bmatrix} -3 & -2 \\ -1 & 2 \end{bmatrix}$

2. Find the change – of – basis matrix $P_{B \rightarrow C}$ from ordered basis B and ordered basis C.

a) $V = R^3$; $B = \left\{ \begin{bmatrix} 2 \\ -5 \\ 0 \end{bmatrix}, \begin{bmatrix} 3 \\ 0 \\ 5 \end{bmatrix}, \begin{bmatrix} 8 \\ -2 \\ 9 \end{bmatrix} \right\}$ and $C = \left\{ \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 3 \end{bmatrix} \right\}$

c) $V = P_2$; $B = \{2 + x^2, -1 - 6x + 8x^2, -7 - 3x - 9x^2\}$ and $C = \{1 + x, -x + x^2, 1 + 2x^2\}$