Some Change-of-Bases Practice

Linear Algebra

College of the Atlantic

Consider the basis

$$\mathcal{B} = \left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \end{bmatrix} \right\} . \tag{1}$$

1. If $\{\vec{x}\}_{\mathcal{B}} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$, what is $\vec{x}$?

2. Write a matrix $P_{\mathcal{B}}$ that takes a vector $\{\vec{x}\}_{\mathcal{B}}$ and expresses it in the standard basis.

3. Suppose $\vec{x} = \begin{bmatrix} -2 \\ 4 \end{bmatrix}$. How would you determine $\{\vec{x}\}_{\mathcal{B}}$, its representation in the $\mathcal{B}$ basis?

4. Express what you did in the previous problem as a matrix multiplication.