☞ Quiz: Sections 4.7 | Linear Algebra MATH 310 R. Hammack | November 17, 2016

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Directions: Please answer in the space provided. No calculators. Please put all phones, etc., away.

1. Consider the basis $B = \{(1,2), (3,4)\}$ of $\mathbb{R}^2$. Find the coordinate vector $[x]_B$ for $x = (5,6)$.

We know $[x]_B = \begin{bmatrix} x \\ y \end{bmatrix}$ where $x(1,2) + y(3,4) = (5,6)$.

Thus $(x+3y, 2x+4y) = (5,6)$.

This yields the system

$$\begin{cases} x + 3y = 5 \\ 2x + 4y = 6 \end{cases}$$

Solving, $\left[\begin{array}{cc|c} 1 & 3 & 5 \\ 2 & 4 & 6 \end{array}\right] \longrightarrow \left[\begin{array}{cc|c} 1 & 3 & 5 \\ 0 & -2 & -4 \end{array}\right]$

$$\longrightarrow \left[\begin{array}{cc|c} 1 & 3 & 5 \\ 0 & 1 & 2 \end{array}\right] \longrightarrow \left[\begin{array}{cc|c} 1 & 0 & -1 \\ 0 & 1 & 2 \end{array}\right] \quad \begin{array}{l} x = -1 \\ y = 2 \end{array}$$

Therefore $\boxed{[x]_B = \begin{bmatrix} -1 \\ 2 \end{bmatrix}}$.

Check $-1(1,2) + 2(3,4) = (5,6)$ ✓