

MATH 260 – QUIZ #5

Name: KEJ

**Directions:** Please show all work for maximum credit. This quiz is worth 10 points. Good luck!

1. Given  $B$  is the ordered basis  $\{(9,2), (4,-3)\}$  and  $B'$  is the ordered basis  $\{(2,1), (-3,1)\}$ .

(4 points) a. Find the transition matrix  $P$  from  $B$  to  $B'$ .

$$\begin{aligned} \left[ \begin{array}{cc|cc} 2 & -3 & 9 & 4 \\ 1 & 1 & 2 & -3 \end{array} \right] &\xrightarrow{R_1 \leftrightarrow R_2} \left[ \begin{array}{cc|cc} 1 & 1 & 2 & -3 \\ 2 & -3 & 9 & 4 \end{array} \right] \\ &\xrightarrow{-2R_1 + R_2 \rightarrow R_2} \left[ \begin{array}{cc|cc} 1 & 1 & 2 & -3 \\ 0 & -5 & 5 & 10 \end{array} \right] \\ &\xrightarrow{-\frac{1}{5}R_2} \left[ \begin{array}{cc|cc} 1 & 1 & 2 & -3 \\ 0 & 1 & -1 & -2 \end{array} \right] \xrightarrow{-1R_2 + R_1 \rightarrow R_1} \left[ \begin{array}{cc|cc} 1 & 0 & 3 & -1 \\ 0 & 1 & -1 & -2 \end{array} \right] \\ &P = \begin{bmatrix} 3 & -1 \\ -1 & -2 \end{bmatrix} \end{aligned}$$

(2 points) b. Given the vector  $[\vec{v}]_B = \begin{bmatrix} -5 \\ 3 \end{bmatrix}$ . Use matrix  $P$  to compute  $[\vec{v}]_{B'}$ .

$$\begin{bmatrix} 3 & -1 \\ -1 & -2 \end{bmatrix} \begin{bmatrix} -5 \\ 3 \end{bmatrix} = \begin{bmatrix} -18 \\ -11 \end{bmatrix} = [\vec{v}]_{B'}$$

2. Given  $\vec{x} = (3, -2, 4)$ ,  $\vec{y} = (4, 5, -1)$ . Find:

(2 points) a.  $\langle \vec{x}, \vec{y} \rangle = (3, -2, 4) \cdot (4, 5, -1) = 12 - 10 - 4 = -2$

(2 points) b.  $\|\vec{x}\| = \sqrt{9 + 4 + 16} = \sqrt{29}$