

Math 3160 - Quiz 6

Name: _____

1. Let $B = \{(1, 2, 1), (0, 1, 2), (0, -1, 0)\}$.
 - (a) Is B a basis for \mathbb{R}^3
 - (b) Write the vector $(1, 0, -1)$ relative to the basis B .
 - (c) Write the vector (a, b, c) relative to the basis B .
 - (d) Find the change of basis matrix from the standard basis to the basis B . (we called it $P_{\text{STANDARD} \rightarrow B}$ in class).
2. For the following system of linear equations.
$$\begin{array}{rrrrr} 2x_1 & -2x_2 & +4x_3 & & -6x_5 & = 2 \\ & & x_3 & +6x_4 & & = 0 \end{array}$$
 - (a) Find the solution set.
 - (b) Find a basis for the solution set.
 - (c) What is the dimension of that solution set?
3. For the following subspace of P_3
$$W = \{a + bx + cx^2 + dx^3 : a = -c \text{ and } b = c + d\}$$
 - (a) Find a basis for W .
 - (b) What is the dimension of that solution set?
4. Find a a basis and dimension for the following.
 - (a) $\text{span}((1, -2, 1), (1, 1, 1), (-2, 3, -2))$
 - (b) $\{(x, y, z, w) \in \mathbb{R}^4 : x + y - 2z = 0 \text{ and } 3y - z - w = 0\}$
5. Let $B_1 = \{(-1, 1), (2, 3)\}$, $B_2 = \{(1, -1), (1, 1)\}$ and let B be the standard unit basis for \mathbb{R}^2 .
 - (a) Find the change of basis matrices for $P_{B_1 \rightarrow B_2}$ and $P_{B_1 \rightarrow B}$.
 - (b) Find the coordinates of the point $(4, 6)$ (given in the standard basis) relative to the bases B_1 and B_2 .
 - (c) Find the change of basis matrices for $P_{B \rightarrow B_2}$ and $P_{B_2 \rightarrow B}$.
 - (d) Find the coordinates of the point $(2, -4)$ (given in the standard basis) relative to the bases B and B_2 . Graph this point the two separate coordinate axes B and B_2 .

6. Diagonalize the following matrices if possible. If not possible state why.

$$A = \begin{bmatrix} 1 & 3 \\ 1 & -1 \end{bmatrix}, B = \begin{bmatrix} 6 & 3 & -8 \\ 0 & -2 & 0 \\ 1 & 0 & -3 \end{bmatrix} \text{ and}$$

$$C = \begin{bmatrix} 4 & 0 & -1 \\ 0 & 3 & 0 \\ 1 & 0 & 2 \end{bmatrix}$$