**Linear Algebra Final Practice (範圍:3-1~3-4, 4-1~4-6, 5-1~5-2)**

1. Find the transition matrix *P* from the basis *B* = {(1, 2), (3, –1)} of **R**2 to the basis *B’*= {(3, 1), (5, 2)}. If **u** is a vector such that **u***B* =, find **u***B'*.
2. Consider the linear transformation *T*: **R**3→**R**2, defined by *T*(*x*, *y*, *z*) = (*x* + *y*, 2*z*). Find the matrix of *T* with respect to the basis {**u**1, **u**2, **u**3} and {**u***’*1, **u***’*2} of **R**3 and **R**2, where **u**1 = (1, 1, 0), **u**2 = (0, 1, 4), **u**3 = (1, 2, 3), and **u***’*1 = (1, 0), **u***’*2 = (0, 2). Use this matrix to find the image of the vector **u** = (2, 3, 5).
3. Determine whether the vector (3, −1, 11) lies in the subspace span {(−1, 5, 3), (2, −3, 4)} of **R**3.
4. Determine whether the set {(1, 2, 0), (0, 1, −1), (1, 1, 2)} is linearly independent in **R**3.
5. Find a basis for the column space of the matrix **A**=, and determine its rank.
6. Determine the projection of the vector **v** = (6, 7) onto the vector **u** = (1, 4).
7. The set {(1, 2, 0, 3), (4, 0, 5, 8), (8, 1, 5, 6)} is linearly independent in **R**4. The vectors form a basis for a three-dimensional subspace *V* of **R**4. Construct an orthonormal basis for *V*.
8. The following vectors **u**1= (1, 0, 0), **u**2= (0, , ), and **u**3= (0, , −) form an orthonormal basis for **R**3. Express the vector **v**= (7, −5, 10) as a linear combination of these vectors.
9. Solve the system of linear equations using Cramer’s rule.



1. Find the characteristic polynomials, eigenvalues, and corresponding eigenspaces of the matrix
2. Use the formula for the inverse of a matrix to compute the inverse of the matrix.
3. If *B* is a 2 \* 2 matrix with |*B*| = 5, use the properties of determinants to compute the following determinants.

(a) |3*B*| (b) |*B*2| (c) |*BB*t*B*–1|, assuming *B*–1 exist.

1. Show that the matrixis singular.
2. Determine values ofλfor which the following system of equations has nontrivial solutions. Find the solutions for each value ofλ.

