

東吳大學 109 學年度暑假轉學生招生考試試題

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系級	數學系三年級	考試時間	100 分鐘
科目	線性代數	本科總分	100 分

※一律作答於答案卷上(題上作答不予計分)；並務必標明題號，依序作答。

1. (20%) Consider the homogeneous linear system

$$\begin{aligned} 3x - y + 2z + w &= 0 \\ 6x - 2y - 4z &= 0. \end{aligned}$$

Find a basis for the solution space, and find the dimension of that space.

2. (20%) Let $n \in \mathbb{N}$, and H_n be the set of all $n \times n$ symmetric matrices. Prove that H_n is a subspace of the space of $n \times n$ matrices. Find a basis for H_4 . What is $\dim(H_4)$?

3. (20%) Let $A = \begin{pmatrix} 2 & 0 & -3 \\ 0 & -3 & 2 \\ -1 & 0 & 2 \end{pmatrix}$. Find the inverse of A .

4. (20%) Apply Gram-Schmidt Orthonormalization process to the vectors $u_1 = (1, 1, 1)$, $u_2 = (1, 0, -1)$, $u_3 = (2, 1, -1)$ with respect to the standard inner product.

5. (20%) Let $A = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$. Find an orthogonal matrix Q so that $Q^T A Q$ is a diagonal matrix.