

東吳大學 104 學年度碩士班研究生招生考試試題

第 1 頁，共 1 頁

系級	數學系碩士班 B 組(決策科學與海量資料分析)	考試時間	100 分鐘
科目	基礎數學	本科總分	100 分

1. (16 points) Find the limits.

$$(a) \lim_{x \rightarrow 0} x^2(1 + \cot^2 3x). \quad (b) \lim_{n \rightarrow \infty} (n^2 + n)^{1/n}.$$

2. (16 points) Assume that f is a continuous function and that

$$\int_0^x tf(t)dt = \sin 2x - x \cos x.$$

(a) Determine $f(\pi/4)$.

(b) Find $f'(x)$.

3. (18 points) Evaluate the integrals.

$$(a) \int \sec^3 x \tan x dx. \quad (b) \int x^3 e^{x^2} dx.$$

4. (16 points) Let $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$ be a linear transformation such that

$$T(1, 1, 1) = (2, 0, -1), \quad T(0, -1, 2) = (-3, 2, -1), \quad T(1, 0, 1) = (1, 1, 0).$$

Find $T(2, -1, 1)$.

5. (16 points) Determine whether the linear transformation $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$ defined by

$$T(x_1, x_2, x_3) = (x_1 + x_2, x_2 + x_3, x_1 + x_3)$$

is invertible. If it is, then find its inverse.

6. (18 points) Let $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 0 \\ 2 & 0 & 1 \end{bmatrix}$. Find a nonsingular matrix P and a diagonal matrix Λ such that $P^{-1}AP = \Lambda$.