東吳大學 108 學年度碩士班研究生招生考試試題

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

(I) Calculus

1. 20%

   (a) 10% Differentiate (i) $f(x)=(3x^2-\ln x+1)^5$ (ii) $f(x)=\dfrac{x^2+2x+3}{x+1}$

   (b) 10% Evaluate (i) $\int \dfrac{x}{x^2+1}\,dx$ (ii) $\int_0^{\pi/4}\sin(2x)\,dx$

2. 20%

   (a) 5% State the Extreme Value (Max-Min) Theorem.

   (b) 15% Find the extreme values of $f(x)=-x^3+12x+5$ on $-3\le x\le 3$.

3. 20%

   (a) 10% Find the Taylor's formula with remainder of order n generated by $f(x)=e^x$ at x=0.

   (b) 10% Show that the Taylor series generated by $f(x)=e^x$ at x=0 converges to $f(x)$ for every real value of x.

(II) Linear Algebra

1. 20%

   (a) 10% Let $\boldsymbol{E}$ be an $n\times n$ elementary matrix, what is the determinant det($\boldsymbol{E}$) of $\boldsymbol{E}$?

   (b) 10% Determine whether the set $\boldsymbol{W}$ of all 2×2 real symmetric matrices is a vector subspace of $\boldsymbol{M}_{22}$ (all 2×2 real matrices). Is $\boldsymbol{W}$ a finite-dimensional vector subspace?

2. 20%

   Find the least squares straight line fit to the four points (0,1), (1,3), (2,4) and (3,4).