

Further Maths is marked on precise statement more than any other paper: an eigenvector without its eigenvalue, a proof without its inductive assumption, a series without its interval of validity. These are the terms whose imprecision costs whole questions. 进阶数学最重表述精确: 特征向量要配特征值, 归纳法要写假设, 级数要写收敛区间。

Matrices and linear algebra

Determinant 行列式 — a scalar computed from a square matrix; it is zero exactly when the matrix is singular and has no inverse

Singular matrix 奇异矩阵 — a square matrix with zero determinant, which therefore has no inverse and maps space onto a lower dimension

Eigenvalue 特征值 — a scalar λ for which $Ax = \lambda x$ has a non-zero solution

Eigenvector 特征向量 — a non-zero vector whose direction is unchanged by the transformation, scaled by its eigenvalue

Invariant line 不变直线 — a line mapped onto itself by a transformation; a line of invariant POINTS is the stronger condition that each point is fixed

Diagonalisation 对角化 — writing A as PDP^{-1} with D diagonal, which makes powers of A easy to compute

Complex numbers

Argand diagram 阿甘图 — the plane in which a complex number is plotted with real part on the horizontal and imaginary part on the vertical axis

Modulus 模 — the distance of a complex number from the origin

Argument 辐角 — the angle from the positive real axis to the number, conventionally in the interval $(-\pi, \pi]$

De Moivre's theorem 棣莫弗定理 — $(\cos \theta + i \sin \theta)^n = \cos n\theta + i \sin n\theta$, the basis for finding roots and expanding powers

Root of unity 单位根 — a solution of $z^n = 1$; the n roots are equally spaced around the unit circle

Series, proof and calculus

Proof by induction 数学归纳法 — proving a base case, ASSUMING the statement for $n = k$, and deducing it for $n = k + 1$; the assumption must be stated explicitly

Method of differences 差分法 — summing a series by writing each term as a difference so that intermediate terms cancel

Maclaurin series 麦克劳林级数 — a Taylor series about zero; its interval of validity must be stated when asked

Reduction formula 递推公式 — a relation expressing an integral in terms of a simpler one of the same family, applied repeatedly

Hyperbolic function 双曲函数 — $\cosh x = \frac{1}{2}(e^x + e^{-x})$ and $\sinh x = \frac{1}{2}(e^x - e^{-x})$, satisfying $\cosh^2 x - \sinh^2 x = 1$

Further mechanics and statistics

Impulse-momentum principle 冲量动量定理 — the impulse of a force equals the change in momentum it produces

Coefficient of restitution 恢复系数 — the ratio of separation speed to approach speed along the line of impact; 1 is perfectly elastic and 0 perfectly inelastic

Centre of mass 质心 — the point at which the whole mass of a body may be considered to act

Continuous random variable 连续随机变量 — a variable taking any value in an interval, whose probabilities are areas under a density function

Probability density function 概率密度函数 — a non-negative function whose total area is 1, and whose area over an interval gives the probability of falling in it

Null hypothesis 零假设 — the statement assumed true for the purpose of a test, rejected only when the evidence against it is sufficiently strong