<u>"The Knowledge"</u> FOR EXTRA PURE

The form of the complementary function given the roots of the auxiliary equation for a second order recurrence relation

Roots of auxiliary equation	Complementary function
Real and distinct λ_1 and λ_2	$p imes \lambda_1^n + q imes \lambda_2^n$
Repeated real root λ	$(p+qn)\lambda^n$
Complex roots $r(\cos\theta + i\sin\theta)$	$r^n(p\cos(n\theta) + q\sin(n\theta))$

How to change your trial function for a recurrence relation if the natural choice appears in the complementary function

Multiply the trial function by n

The equation satisfied by an eigenvector and its corresponding eigenvalue

 $Mv = \lambda v$ or $(M - \lambda I)v = 0$

The eigenvalues for a matrix representing a reflection, and the geometrical significance of its eigenvectors

Eigenvalue of 1 corresponding to an eigenvector that is the mirror line (or in the plane of reflection in 3D).

Eigenvalue of - I corresponding to an eigenvector that is perpendicular to the mirror line or plane of reflection.

The eigenvalues for a matrix representing a rotation, and the geometrical significance of its eigenvectors

In 2D: no eigenvalues.

In 3D: eigenvalue of I corresponding to an eigenvector that is the axis of rotation.

The result for diagonalising a matrix

 $M = PDP^{-1}$ (or sometimes written as $D = P^{-1}MP$), where D has diagonal entries that are the eigenvalues of M and P has columns that are the eigenvectors of M

The definition of the characteristic equation

The equation $det(\mathbf{M} - \lambda \mathbf{I}) = 0$

The Cayley-Hamilton theorem

A matrix satisfies its own characteristic equation.

The criteria for (G,*) to be a group

G is closed under *, * is associative, G contains an identity element, and every element in G has an inverse that is also in G.

The definition of an Abelian group

A group where the operation is commutative.

The definition of a cyclic group

A group with an element that has the same order as the order of the group.

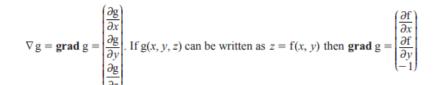
Lagrange's theorem

If H is a subgroup of a finite group G, then the order of H divides the order of G.

The meaning of a section and of a contour of a surface

A section has a fixed x or a fixed y value. A contour has a fixed z value.

The meaning and significance of grad g



<mark>(in the formula booklet).</mark>

 ${f grad} \; {m g}$ is perpendicular to the surface.