ADVANCED PLACEMENT TEST

COURSE DESCRIPTION

MA2001 - Linear Algebra I

This is a first course in linear algebra. Fundamental concepts of linear algebra will be introduced and investigated in the context of the Euclidean spaces R^n. Proofs of results will be presented in the concrete setting. Students are expected to acquire computational facilities and geometric intuition with regard to vectors and matrices. Some applications will be presented.

Syllabus

1. **Systems of linear equations**
   - Matrices
   - Elementary row operations
   - Gauss-Jordan elimination
   - Matrix inverses

2. **Determinants**
   - Cofactor expansion
   - Properties of determinants

3. **Euclidean n-space**
   - Subspaces
   - Linear independence
   - Basis and dimension
   - Rank of a matrix

4. **Linear transformations from R^n to R^m**
   - Kernel and range
   - Rank and nullity theorem

5. **Inner products**
   - Angles and orthogonality
   - Orthonormal bases
   - Gram-Schmidt process

6. **Eigenvalues and eigenvectors**
   - Diagonalization
   - Similarity

7. **Applications**

Recommended Text

1. *Linear Algebra I* by Ma Siu Lun, Victor Tan, Ng Kah Loon
2. *Elementary Linear Algebra* by Howard Anton and Chris Rorres.

MA2002 - Calculus

This is a course in single-variable calculus. We will introduce precise definitions of limit, continuity, the derivative and the Riemann integral. Students will be exposed to computational techniques and applications of differentiation and integration. This course concludes with an introduction to first order differential equations.

Syllabus

1. **Functions**
   - Precise definitions of limit and continuity
   - Intermediate Value Theorem
   - Tangents, velocities and rates of change

2. **Differentiation**
   - Definition of the derivative
   - Differentiation formulas
   - Chain rule
   - Implicit differentiation
   - Higher derivatives
   - The Mean Value Theorem
   - Curve sketching
   - Elementary transcendental functions and their inverses

3. **Integration**
   - Antiderivatives
   - Definition of the Riemann integral
   - The Fundamental Theorem of Calculus

4. **Techniques of integration**
   - Substitution
   - Integration by parts
   - Trigonometric substitutions
   - Partial fractions

5. **Applications**
   - Area between curves
   - Volume of solids of revolution
   - Arc length

6. **First order differential equations**
   - Separable equations
   - Homogeneous equations
   - Integrating factors
   - Linear first order equations

Recommended Text

1. *Thomas' Calculus* by Maurice D Weir, Joel Hass, Frank R Giordano.
2. *Calculus* by James Stewart.