## UNIT 3 SPECIALIST MATHS <br> INDEX

## Coordinate Geometry

Sketching Power Functions Defined by $f(x)=a x^{m}+b x^{-n}$
Method 1: Addition of Ordinates
Method 2: Considering Essential Features
Sketching Rational Algebraic Functions Defined by $f(x)=\frac{P(x)}{Q(x)}$
Key Features on Sketch Graphs - Summary
Method 3: Sketching Reciprocal Functions
The Ellipse
The Hyperbola
The Conjugate Hyperbola
The Modulus Function

## Vectors

Vector Notations
Position Vectors
Equality of Vectors
Addition of Vectors
The Identity Vector
The Inverse Vector
Subtraction of Vectors
Multiplication of a Vector by a Scalar
Unit Vectors
Vectors in 3 Dimensional Space
Position Vectors
The Magnitude of a Vector
Creating Unit Vectors
The Scalar Product of Two Vectors
Properties of the Scalar Product
Scalar Product in Component Form
Angles Between Vectors
Resolution of Vectors
Scalar Resolutes
Vector Resolutes
Linear Dependence and Independence
Vector Proofs
Circle Geometry
Geometric Proofs Using Vectors

## Circular (Trigonometric) Functions

## Exact Values

Graphs of Trigonometric Functions
The Fundamental Identities
The Addition Theorems

The Double Angle Formulae Inverse Circular Functions<br>Maximal Domains and Ranges<br>Transformations of Functions - Summary

## Complex Numbers

The Imaginary Number
Operations Involving Imaginary Numbers

## Properties of Complex Numbers

## Equality

Addition and Subtraction
Multiplication
Complex Conjugates
Magnitude
The Multiplicative Inverse
Division of Complex Numbers

## The Complex Number Plane

## Geometrical Interpretation of Subtraction

Polar Form
Converting Cartesian Forms into Polar Form
Converting the Polar Form into Cartesian Form
Multiplication and Division in Polar Form
Geometrical Interpretation of Multiplication and Division

## De Moivre's Theorem

Solving Equations in the Form $z^{n}=a$ Using De Moivre's Theorem
Finding nth Roots of a Complex Number
The nth Roots of Unity
Finding Square Roots in Exact Cartesian Form

## Polynomials Over C

The Fundamental Theorem of Algebra<br>The Factor Theorem<br>The Conjugate Root Theorem<br>Factors Over C of Polynomials<br>Factorising Quadratics Over C<br>Factorising Cubics Over C<br>Factorising Polynomials of Degree Greater Than 3 Over C

## Solution Over C of Polynomial Equations

Relations and Regions in the Complex Plane
Relations in the Complex Plane
Restrictions on Magnitude
Solving Questions Involving Restrictions on Magnitude

Rays and Lines
Common Types of Relations - Summary

## Regions in the Complex Plane

Common Types of Regions - Summary

## Differential Calculus

Formula
The Derivative of $\tan (k x)$ and $\cot (k x)$
The Second Derivative
Applications of the Second Derivative
Implicit Differentiation
Derivatives of Inverse Circular Functions

## Integral Calculus (Part 1) - Techniques in Anti-Differentiation

Definition
Basic Properties
Standard Anti-Derivatives
Linear Substitution
The 'Reverse Chain Rule'
Anti-Derivatives of $\frac{1}{\sqrt{a^{2}-x^{2}}}$ and $\frac{1}{a^{2}+x^{2}}$
Anti-Derivatives of $\sin ^{2}(k x)$ and $\cos ^{2}(k x)$
Anti-Derivatives of odd powers of $\sin (k x)$ and $\cos (k x)$
Anti-Derivatives of $\tan ^{n}(k x)$ and $\cot ^{m}(k x)$
Anti-Derivatives of Expressions of the Form $\sin ^{m}(k x) \cos ^{n}(k x)$
Partial Fraction Decomposition
Rational Functions
$\mathrm{N}(\mathrm{x})=$ Polynomial of Degree 2 or Higher
Anti-Derivatives of Rational Functions with Quadratic Denominators
Anti-Differentiation by Recognition
The Relationship between the Graph of a Function and the Graph of its Anti-Derivative

## Integral Calculus (Part 2) - Integration and its Applications

Definite Integrals
Basic Properties
The Area Under a Curve
The Area Between a Curve and the Y Axis
The Area Between Two Curves
Volumes of Solids of Revolution
Lengths of Curves in the Plane
The Length of a Parametric Curve

