

SYLLABUS 2020-2021

STANDARD: 12

SUBJECT: MATHEMATICS

UNIT	CONTENT
1. Applications of Matrices and Determinants	1.1 Introduction 1.2 Inverse of a Non-Singular Square Matrix 1.2.1 Adjoint of a square Matrix 1.2.2 Definition of inverse matrix of a square matrix 1.2.3 Properties of inverses of matrices 1.2.4 Application of matrices to Geometry 1.3 Elementary Transformations of a Matrix 1.3.1 Elementary row and column operations 1.3.2 Row-Echelon form 1.3.3 Rank of a Matrix 1.4 Applications of Matrices: Solving System of Linear Equations 1.4.1 Formation of a System of Linear Equations 1.4.2 System of Linear Equations in Matrix Form 1.4.3 Solution to a System of Linear equations (i) Matrix Inversion Method (ii) Cramer's Rule (iii) Gaussian Elimination Method (*All properties without proof)
2. Complex Numbers	2.1 Introduction to Complex Numbers 2.1.1 Powers of imaginary unit 2.2 Complex Numbers 2.2.1 Rectangular form 2.2.2 Argand plane 2.2.3 Algebraic operations on complex number 2.3 Basic Algebraic Properties of Complex Numbers 2.3.1 Properties of complex numbers 2.4 Conjugate of a Complex Number 2.4.1 Geometrical representation of conjugate of a complex number 2.4.2 Properties of Complex Conjugates

	<p>2.5 Modulus of a Complex Number</p> <p>2.5.1 Properties of Modulus of a complex number</p> <p>2.5.2 Square roots of a complex number</p> <p>2.6 Geometry and Locus of Complex Numbers (*All properties without proof)</p>
3. Theory of Equations	<p>3.1 Introduction</p> <p>3.2 Basics of Polynomial Equations</p> <p>3.2.1 Different types of Polynomial Equations</p> <p>3.2.2 Quadratic Equations</p> <p>3.3 Vieta's Formulae and Formation of Polynomial Equations</p> <p>3.3.1 Vieta's formula for Quadratic Equations</p> <p>3.3.2 Vieta's formula for Polynomial Equations</p> <p>(a) The Fundamental Theorem of Algebra</p> <p>(b) Vieta's Formula</p> <p>(i) Vieta's Formula for Polynomial equation of degree 3</p> <p>(c) Formation of Polynomial Equations with given Roots</p> <p>3.4 Nature of Roots and Nature of Coefficients of Polynomial Equations</p> <p>3.4.1 Imaginary Roots</p> <p>3.4.2 Irrational Roots</p> <p>3.4.3 Rational Roots</p> <p>3.6 Roots of Higher Degree Polynomial Equations</p> <p>3.7 Polynomials with Additional Information</p> <p>3.7.1 Imaginary or Surds Roots</p> <p>3.7.2 Polynomial equations with Even Powers Only</p> <p>3.7.3 Zero Sum of all Coefficients</p> <p>3.7.4 Equal Sums of Coefficients of Odd and Even Powers</p> <p>3.8 Polynomial Equations with no additional information</p> <p>3.8.2 Reciprocal Equations</p> <p>3.9 Descartes Rule</p> <p>3.9.1 Statement of Descartes Rule</p> <p>3.9.2 Attainment of bounds</p> <p>(*All properties without proof)</p>

4. Inverse Trigonometric Functions	4.1 Introduction 4.2 Some Fundamental Concepts 4.2.1 Domain and Range of trigonometric functions 4.2.2 Graphs of functions 4.2.3 Amplitude and Period of a graph 4.2.4 Inverse functions 4.2.5 Graphs of inverse functions 4.3 Sine Function and Inverse Sine Function 4.3.2 Properties of the sine function 4.3.3 The inverse sine function and its properties 4.4 The Cosine Function and Inverse Cosine Function 4.4.2 Properties of the cosine function 4.4.3 The inverse cosine function and its properties 4.5 The Tangent Function and the Inverse Tangent Function 4.5.2 Properties of the tangent function 4.5.3 The inverse tangent function and its properties 4.6 The Cosecant Function and the Inverse Cosecant Function 4.6.2 The inverse cosecant function 4.7 The Secant Function and Inverse Secant Function 4.7.2 Inverse secant function 4.8 The Cotangent Function and the Inverse Cotangent Function 4.8.2 Inverse cotangent function 4.9 Principal Value of Inverse Trigonometric Functions (*All properties without proof)
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5. Two Dimensional Analytical Geometry-II	<ul style="list-style-type: none">5.1 Introduction (Theorem 5.1–5.5 without proof)5.2 Circle<ul style="list-style-type: none">5.2.1 Equation of a circle in standard form5.2.2 Equations of tangent and normal at a point P on a given circle (without proof)5.2.3 Condition for the line $y = mx + c$ to be a tangent to the circle $x^2 + y^2 = a^2$ and finding the point of contact (without proof)5.3 Conics<ul style="list-style-type: none">5.3.1 The general equation of a Conic5.3.2 Parabola5.3.3 Ellipse (Theorem 5.3.3-without proof)5.3.4 Hyperbola (Theorem 5.3.4-without proof)5.4 Conic Sections<ul style="list-style-type: none">5.4.1 Geometric description of conic section5.4.2 Degenerate Forms5.5 Parametric form of Conics<ul style="list-style-type: none">5.5.1 Parametric equations5.6 Tangents and Normals to Conics<ul style="list-style-type: none">5.6.1 Equation of tangent and normal to the parabola $y^2 = 4ax$ (without proof)5.6.2 Equations of tangent and normal to Ellipse and Hyperbola (without proof)5.6.3 Condition for the line $y = mx + c$ to be a tangent to the conic sections (without proof)5.7 Real life Applications of Conics<ul style="list-style-type: none">5.7.1 Parabola5.7.2 Ellipse5.7.3 Hyperbola5.7.4 Reflective property of parabola5.7.5 Reflective property of Ellipse <p>(*All properties without proof)</p>
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6. Applications of Vector Algebra	<ul style="list-style-type: none">6.1 Introduction (Theorems 6.1-6.23-without proof)6.2 Geometric Introduction to Vectors6.3 Scalar Product and Vector Product<ul style="list-style-type: none">6.3.1 Geometrical interpretation6.3.2 Application of dot and cross products in plane Trigonometry6.3.3 Application of dot and cross products in Geometry6.3.4 Application of dot and cross product in Physics6.4 Scalar triple product<ul style="list-style-type: none">6.4.1 Properties of the scalar triple product6.5 Vector triple product6.6 Jacobi's Identity and Lagrange's Identity6.7 Application of Vectors to 3D Geometry<ul style="list-style-type: none">6.7.1 Different forms of equation of a straight line6.7.2 A point on the straight line and the direction of the straight line are given6.7.3 Straight Line passing through two given points6.7.4 Angle between two straight lines6.7.5 Point of intersection of two straight lines6.7.6 Shortest distance between two straight lines6.8 Different forms of Equation of a plane<ul style="list-style-type: none">6.8.1 Equation of a plane when a normal to the plane and the distance of the plane from the origin are given6.8.2 Equation of a plane perpendicular to a vector and passing through a given point6.8.3 Intercept form of the equation of a plane6.8.4 Equation of a plane passing through three given non-collinear points6.8.5 Equation of a plane passing through a given point and parallel to two given non-parallel vectors6.8.6 Equation of a plane passing through two given distinct points and is parallel to a non-zero vector
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	<p>6.8.7 Condition for a line to lie in a plane</p> <p>6.8.8 Condition for coplanarity of two lines</p> <p>6.8.10 Angle between two planes</p> <p>6.8.11 Angle between a line and a plane</p> <p>6.8.12 Distance of a point from a plane</p> <p>6.8.13 Distance between two parallel planes</p> <p>(*All properties without proof)</p>
7. Applications of Differential Calculus	<p>7.1 Introduction</p> <p>7.1.1 Early Developments</p> <p>7.2 Meaning of Derivatives</p> <p>7.2.1 Derivative as slope</p> <p>7.2.2 Derivative as rate of change</p> <p>7.2.3 Related rates</p> <p>7.2.4 Equations of Tangent and Normal</p> <p>7.2.5 Angle between two curves</p> <p>7.5 Indeterminate Forms</p> <p>7.5.1 A Limit Process</p> <p>7.5.2 The l'Hôpital's Rule</p> <p>7.5.3 Indeterminate forms $\left(\frac{0}{0}, \frac{\infty}{\infty}, 0 \times \infty, \infty - \infty\right)$</p> <p>7.6 Applications of First Derivative</p> <p>7.6.1 Monotonicity of functions</p> <p>7.6.2 Absolute maxima and minima</p> <p>7.6.3 Relative Extrema on an Interval</p> <p>7.6.4 Extrema using First Derivative Test</p> <p>7.7 Applications of Second Derivative</p> <p>7.7.1 Concavity, Convexity, and Points of Inflection</p> <p>7.7.2 Extrema using Second Derivative Test</p> <p>7.8 Applications in Optimization</p> <p>(*All properties without proof)</p>
8. Differentials and Partial Derivatives	<p>8.1 Introduction</p> <p>8.2 Linear Approximation and Differentials</p> <p>8.2.2 Errors: Absolute Error, Relative Error, and Percentage Error</p> <p>8.2.3 Differentials</p> <p>(*All properties without proof)</p>

9. Applications of integration	9.1 Introduction 9.3 Fundamental Theorems of Integral Calculus and their Applications 9.5 Improper Integrals 9.6 Reduction Formulae 9.7 Gamma Integral 9.8 Evaluation of Bounded Plane Area by Integration 9.8.1 Area of the region bounded by a curve, x -axis and the lines $x = a$ and $x = b$. 9.8.2 Area of the region bounded by a curve, y -axis and the lines $y = c$ and $y = d$. 9.8.3 Area of the region bounded between two curves (*All properties without proof)
10. Ordinary Differential Equations	10.1 Introduction 10.2 Differential Equation, Order, and Degree 10.4 Formation of Differential Equations 10.4.1 Formation of Differential equations from Physical Situations 10.4.2 Formation of Differential Equations from Geometrical Problems 10.5 Solution of Ordinary Differential Equations 10.6 Solution of First Order and First Degree Differential Equations 10.6.1 Variables Separable Method 10.6.3 Homogeneous Form or Homogeneous Differential Equation 10.7 First Order Linear Differential Equations 10.8 Applications of First Order Ordinary Differential Equations 10.8.1 Population growth 10.8.2. Radioactive decay 10.8.3. Newton's Law of cooling/warming 10.8.4 Mixture problems

11. Probability Distributions	11.1 Introduction 11.2 Random Variable 11.3 Types of Random Variable 11.3.1 Discrete random variables 11.3.2 Probability Mass Function 11.3.3 Cumulative Distribution Function or Distribution Function 11.3.4 Cumulative Distribution Function from Probability Mass function 11.3.5 Probability Mass Function from Cumulative Distribution Function 11.4 Continuous Distributions 11.4.1 The definition of continuous random variable 11.4.2 Probability density function 11.4.3 Distribution function (Cumulative distribution function) 11.4.4 Distribution function from Probability density function 11.4.5 Probability density function from Probability distribution function (*All properties without proof)
12. Discrete Mathematics	12.1 Introduction 12.2 Binary Operations 12.2.1 Definitions 12.2.2 Some more properties of a binary operation 12.2.3 Some binary operations on Boolean Matrices 12.2.4 Modular Arithmetic 12.3 Mathematical Logic 12.3.1 Statement and its truth value 12.3.2 Compound Statements, Logical Connectives, and Truth Tables 12.3.3 Tautology, Contradiction, and Contingency 12.3.4 Duality 12.3.5 Logical Equivalence (*All properties without proof)
(*All examples and exercise problems for the content mentioned above)	