

104 Math

Syllabus-Draft

1. **Conic Sections:** Parabola, Ellipse, Hyperbola:
Geometric properties, Elements, Restriction to conics with horizontal/vertical axes, Canonical equation with Center at origin, with center at $C(h, k)$, Method of Completing the Square.
2. **Algebra:**
 - (a) Matrices: *Definition, Size, Operations (Addition/Subtraction/Multiplication by a scalar/Product/Transpose) and their properties.*
 - (b) Determinants: *Definition, Methods of computation by Arrow technique/ by Cofactor expansion, Properties and elementary operations on rows and columns.*
 - (c) Linear systems (Only Systems with unique solutions): *Cramer's Method, Gauss elimination method with back substitution, Gauss-Jordan elimination method.*
3. **Integration:**
 - (a) Definition of Primitives/Antiderivatives, List of primitives of elementary functions, Operations on primitives.
 - (b) Integration by substitution, Integration by parts,
 - (c) Integration of rational functions:
 - i. *Euclidean division to decrease the degree of de numerator.*
 - ii. *Factorizing the denominator, method of the discriminant.*
 - iii. *Decomposition into partial fractions (simple poles, multiple poles, the case $\frac{ax + b}{x^2 + 1}$).*
 - (d) Application of integration: *area, volume of revolution, washer method and cylindrical shells.*
 - (e) Polar coordinates and connection with Cartesian coordinates. Areas of polar regions (Examples: $r = \text{Constant}$, $\theta = \text{Constant}$, $r = \theta^k$ $k = 1, 2, \dots$).
4. **Functions of several variables:** *Partial differentiation, Chain rule, Implicit differentiation.*
5. **Ordinary differential equations:** *Separable differential equations, First order linear differential equations.*