

MT-100 INTRODUCTION TO MATHEMATICS

Algebra:

Complex Number Properties of complex numbers, conjugates and modules. Geometrical representation of complex numbers $a + ib$. Quadratic Equations Roots of a quadratic equation (real, distinct, equal and imaginary roots). Formation of quadratic equation when the roots are given. Cube Roots of Unity Properties of cube root of unity. Matrices Properties, sum, difference and multiplication of matrices. Cramer's rule, solution of linear equations of three unknowns. Determinants Properties, addition, subtraction and multiplication of determinants, sequence and series, arithmetic progression, standard forms of an A. P.; arithmetic means. Geometric progression, standard forms of a G. P., sum of Infinite geometric series, geometric means. Harmonic progression, harmonic means. Relation between H.M., A.M. and G.M. Permutation and Combination Recognition between permutation and combination cases, factorial $n!$, $0! = 1$ etc. Binomial Expression Expansion of type for positive integer of ' n '. Use of the general term and determine the middle term or terms of the expansion. Partial Fraction Resolve into partial fractions, proper fraction, improper fraction, when all factors of denominator are linear but some are repeated. When denominator has repeated irreducible quadratic factors. Functions One-one function, onto function, even function, odd function, exponential function, trigonometric function and logarithmic function. Circular Measure Understand the definition of radians and use the relationship between radians and degrees. Trigonometric Functions Basic functions e.g. sine, cosine, tangent etc. relation between them. Trigonometric identities sum and difference formulae, multiple angle formulae. Express type $\{a(\sin\theta) + b(\cos\theta)\}$ in $R\sin(\theta \pm \phi)$ etc. Inverse functions.

Differential Calculus:

Limits: Basic concepts; limit of form $\left\{\frac{\sin x}{x}\right\} = 1$; when x tends to zero. Exponent functions and type a^x etc. Differentiation: Differentiation of x^n product and quotient formula, trigonometric functions, exponents and logarithmic functions. Differentiations, minima and maxima, tangent and normal, velocity and acceleration, rate of reaction etc.

Integral Calculus:

Basic Integration: Integrals of sum powers of x , trigonometric functions, exponent functions and logarithmic functions. Integration by parts: e.g. \sin , e and \log etc. Substitution method; understanding of integration form $\int \frac{f(x)}{g(x)} dx$ and $\int f(x) g(x)^n dx$ etc. Standard Application of integration: Area, volume, velocity and acceleration.

Coordinate Geometry:

Lines: Find length, mid-point, gradient of line segment, given the coordinates of end points.
Different forms of equation of a line. Angle between two lines, distance of a point from a line.

Conic Sections:

Circle: Equation of circle using radius and coordinate of center. Tangents and normal.
Parabola: Equation of parabola, focus, vertex, directrix and intersection of parabola.
Ellipse: Equation of ellipse, eccentricity, foci, latus rectum, major and minor axes.
Hyperbola: Equation of hyperbola, foci, directrices, eccentricity and latus rectum etc.