# Miranda House

## Department of Mathematics

**DEPARTMENT OF MATHEMATICS**

**Generic Elective offered by the Department**

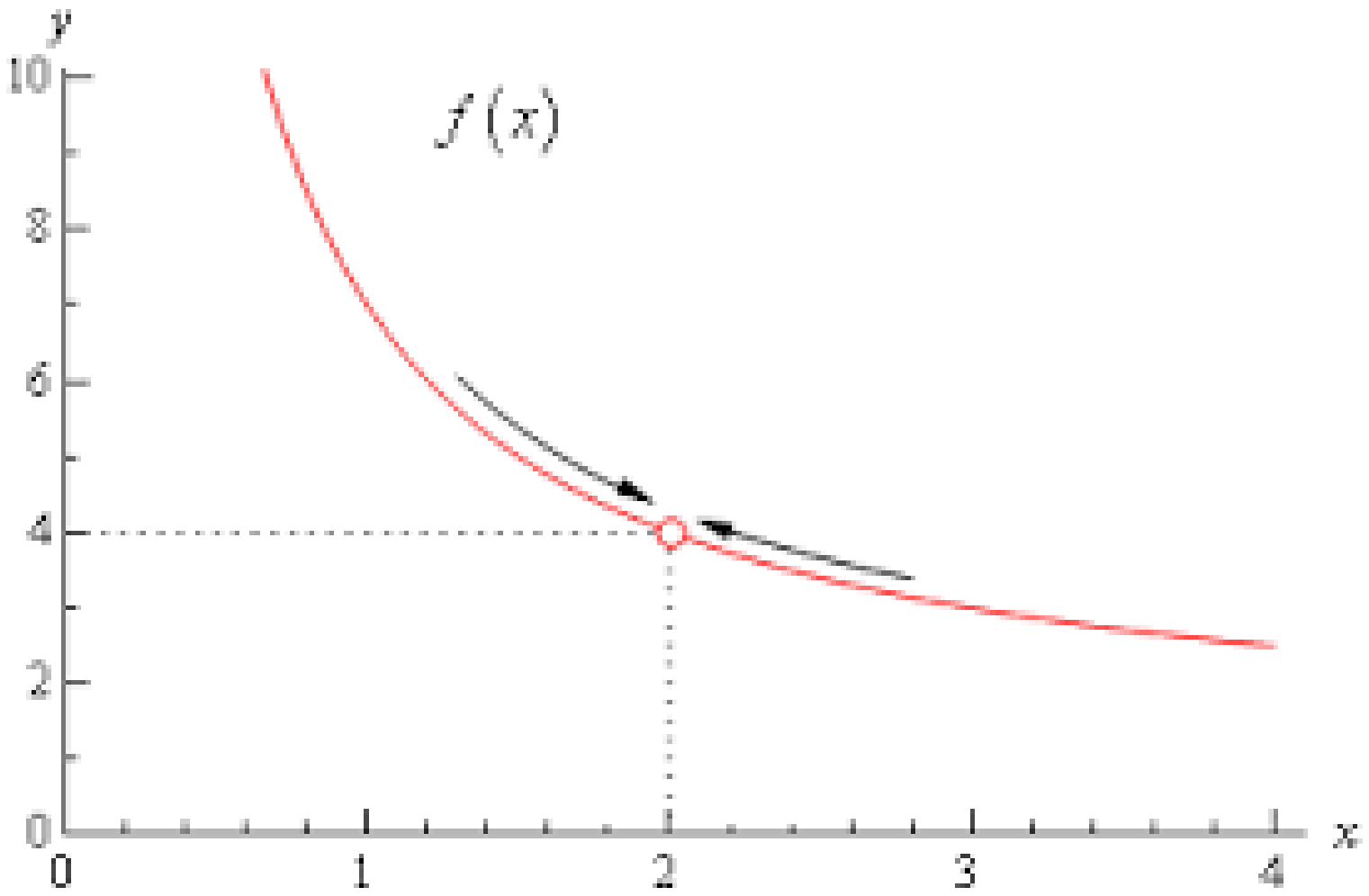
**Generic Elective papers offered for students enrolled in various Honours courses**

| Semester | Paper Name |
|---|---|
| I | Calculus |
| II | Linear Algebra |
| III | Differential equations (with practical)/Linear programming and game theory |
| IV | Numerical Methods(with practical)/Elements of analysis |

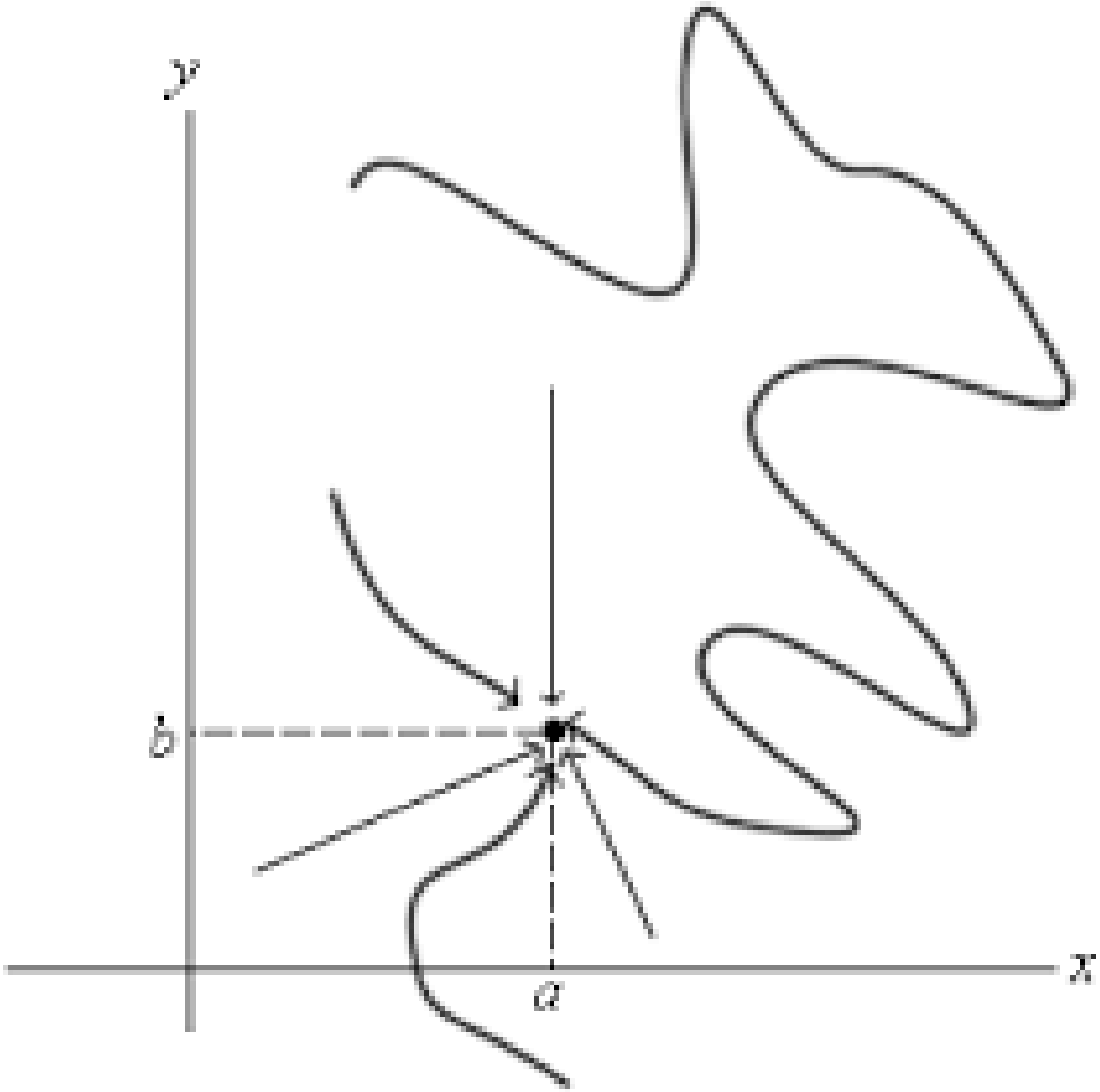
**Generic Elective papers for B.A. Programme**

| Semester | Paper Name |
|---|---|
| V | General Mathematics-1 |
| VI | General mathematics-2 |

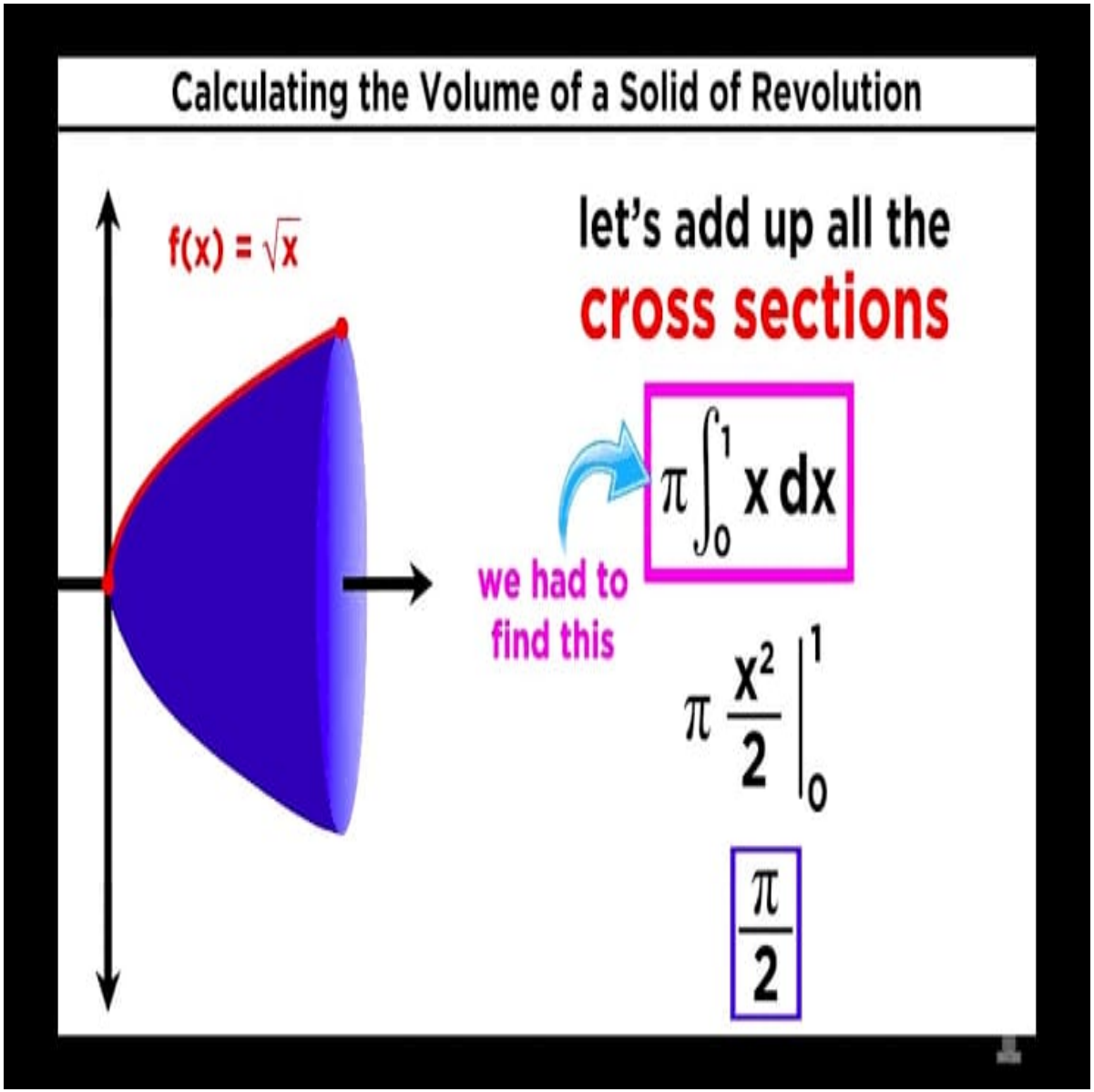
# Limit in one variable



# Limit in two variables



# Volume


Calculating the Volume of a Solid of Revolution
f(x) = √x
let's add up all the
cross sections
we had to
find this
$\pi \int_0^1 x\,dx$
$\pi \frac{x^2}{2}\Big|_0^1$
$\frac{\pi}{2}$

**Unit 1: Applications of Derivatives and Limits**

The first derivative test, Concavity and inflection points, Second derivative test, Curve sketching using first and second derivative test; Limits at infinity, Horizontal asymptotes, Vertical asymptotes, Graphs with asymptotes; L'Hôpital's rule.

**Unit 2: Applications of Definite Integrals**

Volumes by slicing, Volumes of solids of revolution by the disk method, Volumes of solids of revolution by the washer method, Volume by cylindrical shells, Length of plane curves, Arc length of parametric curve, Area of surface of revolution.

## Unit 3: Conics, Vector-Valued Functions and Partial Derivatives

Techniques of sketching conics, Reflection properties of conics; Polar coordinates, graphing in polar coordinates; Vector-valued functions: Limits, Continuity, Derivatives, Integrals, Arc length, Unit tangent vector, Curvature, Unit normal vector; Functions of several variables: Graphs and level curves, Limits and continuity, Partial derivatives and differentiability, The chain rule, Directional derivatives and gradient vectors, Tangent plane and normal line, Extreme values and saddle points.

**Unit 1: Euclidean space Rn and Matrices**

Fundamental operation with vectors in Euclidean space Rn , Linear combination of vectors, Dot product and their properties, Cauchy–Schwarz inequality, Triangle inequality, Projection vectors, Some elementary results on vectors in Rn, Matrices: Gauss–Jordan row reduction, Reduced row echelon form, Row equivalence, Rank, Linear combination of vectors, Row space, Eigenvalues, Eigenvectors, Eigenspace, Characteristic polynomials, Diagonalization of matrices; Definition and examples of vector spaces, Some elementary properties of vector spaces, Subspace, Span, Spanning set for an eigenspace, Linear independence and linear dependence of vectors, Basis and dimension of a vector space, Maximal linearly independent sets, Minimal spanning sets; Application of rank: Homogenous and non-homogenous systems of linear equations; Coordinates of a vector in ordered basis, Transition matrix.

**Unit 2: Linear Transformations and Computer Graphics**

Linear transformations: Definition and examples, Elementary properties, The matrix of a linear transformation, Linear operator and similarity; Application: Computer graphics, Fundamental movements in a plane, Homogenous coordinates, Composition of movements; Kernel and range of a linear transformation, Dimension theorem, One to one and onto linear transformations, Invertible linear transformations, Isomorphism, Isomorphic vector spaces to Rn .

**Unit 3: Orthogonality and Least Square Solutions**

Orthogonal and orthonormal vectors, Orthogonal and orthonormal bases, Orthogonal complement, Projection theorem, Orthogonal projection onto a subspace; Application: Least square solutions for inconsistent systems, Non-unique least square solutions.

For any query contact

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# Thank You