

- Differential equations: introduction, definitions, initial value problem. Differential equations of first and second order with constant coefficients, linear systems of differential equations.
- Laplace transform: definition, properties and theorems. Inverse Laplace transform.
- Linear Algebra: rank of a matrix, eigenvalues and eigenvectors.  
Linear systems: Cramer's rule, Gauss elimination, LU decomposition, general case.
- Function of several real variables: definition, domain and graph.  
Limit and continuity.  
Partial derivative: definition, notations, higher derivatives, rules for finding the partial derivative, Schwarz's theorem. Tangent plane. Exact differential. Total derivative.  
Directional derivative.  
Application of the derivatives in finding the extrema of a function, Lagrange multipliers.  
Vector fields, gradient, divergence, Laplacian and curl. Conservative fields.
- Double integral: definition, properties, methods of integration, change of variables, applications.
- Triple integral: definition, properties, methods of integration, applications.
- Line integral of a vector field: definition, derivation, path independence, applications. Line integral of a scalar field: definition, derivation.
- Surface integral of a vector and a scalar field: definition, derivation, applications.

### **Bibliography**

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### **Mathematical data bases**

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<http://mathworld.wolfram.com/>

<http://eom.springer.de/>