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Tim POSTON and Ian STEWART. — **Catastrophe theory and its applications.** — Surveys and reference works in mathematics, 2. — Un vol. relié, 20 × 26, de XVIII, 491 p. — Prix: £25.00. — Pitman, London/San Francisco/Melbourne, 1978.

Smooth and sudden changes: Catastrophes. The Zeeman catastrophe machine. Gravitational catastrophe machines. Catastrophe theory. — *Multidimensional geometry: Set-theoretic notation.* Euclidean space. Linear transformations. Matrices. Quadratic forms. Two-variable cubic forms. Polynomial geometry. — *Multidimensional calculus: Distance in Euclidean space.* The derivative as tangent. Contours. Partial derivatives. Higher derivatives. Taylor series. Truncated algebra. The inverse function theorem. The implicit function theorem. — *Critical points and transversality: Critical points.* The Morse lemma. Functions of a single variable. Functions of several variables. The splitting lemma. Structural stability. Manifolds. Transversality. Transversality and stability. Transversality for mappings. Codimension. — *Machines revisited: The Zeeman machine.* The canonical cusp catastrophe. Dynamics of the Zeeman machine. The gravitational machines. Formulation of a general problem. — *Structural stability: Equivalence of families.* Structural stability of families. Physical interpretations of structural stability. The Morse and splitting lemmas for families. Catastrophe geometry. — *Thom's classification theorem: Functions and families of functions.* One-parameter families. Non transversality and symmetry. Two-parameter families. Three-, four- and five-parameter families. Higher catastrophes. Thom's theorem. — *Determinacy and unfoldings: Determinacy.* One-variable jet spaces. Infinitesimal changes of variable. Weaker determinacy conditions. Transformations that move the origin. Tangency and transversality. Codimension and unfoldings. Transversality and universality. Strong equivalence of unfoldings. Numbers associated with singularities. Inequalities. Summary of results and calculation methods. Examples and calculations. Compulsory remarks on terminology. — *The first seven catastrophe geometries: The objects of study.* The fold catastrophe. The cusp catastrophe. The swallowtail catastrophe. The butterfly catastrophe. The elliptic umbilic. The hyperbolic umbilic. The parabolic umbilic. Ruled surfaces. — *Stability of ships: Static equilibrium.* Ship shapes. — *The geometry of fluids: Background on fluid mechanics.* Stability and experiment. Combing polymer molecules. Degenerate flows. — *Optics and scattering theory: Ray optics.* Wave optics. Applications. — *Elastic structures: General theory.* Euler struts. The geometry of collapse. Buckling plates. Dynamics. — *Thermodynamics and phase transitions: equations of state.* Thermodynamic potentials. Fluctuations and critical exponents. The rôle of symmetry. — *Laser physics: Preliminaries.* The laser catastrophe. Experiments. Analytic correspondence. — *Biology and ecology: The size of bee societies.* Constraint catastrophes. Travelling waves in ecology. Embryology. — *The problems of social modelling: Identification of variables.* The archaeology of sudden change. Catastrophes as models. Prison riots. Bistability of perception. Alcohol

and introverts. Beyond elementary catastrophe theory. — *Catastrophe theory: whither away?* The present state. The future. — *Appendix 1*: Computer program for determinacy and unfoldings, by D. R. Olsen, S. R. Carter and A. Rockwood. — *Appendix 2*: Catastrophes in numerical analysis.

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Computation of eigenvalues: The method proposed by Picone for computing eigenvalues and eigenvectors of general linear equations. Computation of the eigenvalues of symmetric operators, statement of the problem. The Rayleigh-Ritz method and the Plancherel convergence theorem. The maximum-minimum principle, Weinstein's method for the clamped plate. Aronszajn's formulation and extension of the Weinstein method. The method of Weyl and Courant concerning the asymptotic distribution of the eigenvalues in the classical problems of mathematical physics. The Carleman method for the asymptotic theory of eigenvalues and eigenfunctions. Preliminaries to the orthogonal invariants method. The orthogonal invariants method for computing lower bounds to the eigenvalues of problem (1.2.1). The orthogonal invariants of integral operators. Eigenvalue problems for ordinary differential equations. The orthogonal invariants of second order ordinary linear differential operators. Improvement of the lower bounds using a computer of limited capacity. Robert's formulae for the orthogonal invariants. Invariant subspaces and ordering of the bounds. Computation of the orthogonal invariants for elliptic differential operators, special theory. The Green matrix and the eigenvalue computations in the first elastostatic problem. Iterated elliptic operators, generalized biharmonic problem. The structure theorem of the Green operator and the orthogonal invariants method for the clamped plate problem. Computation of the eigenvalues of the square clamped plate. The eigenvalues of the circular clamped plate. Eigenvalue problems for plane elasticity. Invariant subspaces for the elasticity operator in a cube. Computation of the orthogonal invariants for elliptic differential operators, general theory. The eigenfrequencies of a heterogeneous elastic body. The eigenfrequencies of incompressible elastic bodies and the related analytical problems. Computation of the eigenvalue's multiplicity. Approximations and estimates for eigenvectors. An eigenvalue problem proposed by Ostrowski. Miscellaneous results concerning eigenvalue theory. — « *A priori* » estimates for solutions of differential equations: Global estimates connected with a class of linear transformations. The general existence principle in Banach spaces and the dual estimation formulae. Examples of dual estimates. The maximum modulus theorem for the elasticity equation. Proof of a conjecture of Mikhlin and extension of the Marcel Riesz inequalities to three-dimensional space. The estimates for the exterior differential forms equivalent to the existence theorems of de Rham. Boundary value problems for second order elliptic-parabolic equations and related estimates. Estimates of physical quantities: the stress concentration coefficient in an incoming vertex of a prism under torsion. Estimates of physical quantities: the electrostatic capacity of a conductor. Distribution of electric load near the vertices and the edges of a cube.

Herbert PIEPER. — **Variationen über ein zahlentheoretisches Thema von Carl Friedrich Gauss.** — Wissenschaft und Kultur, Band 33. — Un vol. relié, 15 × 20,5, de 183 p. — Prix: FS 20.00. — Birkhäuser Verlag, Basel und Stuttgart, 1978.

Überblick. — *Übersicht über die hier gegebenen Beweise des quadratischen Reziprozitätsgesetzes.* — *Einführung:* Quadratische Reste. — *Thema:* Beweis des quadratischen Reziprozitätsgesetzes. — *Variation 1:* Das Legendre-Jacobi-Symbol. — *Variation 2:* Vollständige Induktion ohne den Gaußschen Existenzsatz. — *Variation 3:* Das Gaußsche Lemma. — *Variation 4:* Anzahl der negativen Minimalreste. — *Variation 5:* Gaußsches Lemma und Gitterpunkte. — *Variation 6:* Vorzeichen eines Produkts (mit Gaußschem Lemma). — *Variation 7:* Vorzeichen eines Produkts (mit Gaußschem Existenzsatz und Induktion). — *Variation 8:* Das Gauss-Symbol (verallgemeinertes Gaußsches Lemma). — *Variation 9:* Permutationen. — *Variation 10:* Gaußsche Summen (mit Vorzeichenbestimmung). — *Variation 11:* Kreisteilung (Gaußsche Summen ohne Vorzeichenbestimmung). — *Variation 12:* Gaußsche Summen in endlichen Körpern. —

$$1 - \left(\frac{-1}{q}\right)^q$$

Variation 13: Die quadratische Gleichung $x^2 + x + \frac{1 - \left(\frac{-1}{q}\right)^q}{4} = 0$ in F_p . — *Variation 14:* Faktorzerlegung gewisser Polynome in F_p . — *Anhang 1:* Einige Ergebnisse der elementaren Zahlentheorie. — *Anhang 2:* Endliche Körper.

Rolf WALTER. — **Differentialgeometrie.** — Un vol. broché, 14 × 21, de III, 278 p. — Prix: DM 28.00. — Bibliographisches Institut, Mannheim/Wien/Zürich, 1978.

Elementare Differentialgeometrie: Grundlegendes über Kurven. Kurven im \mathbb{R}^2 . Vierscheitelsatz. Kurven im \mathbb{R}^3 . Flächenstücke im \mathbb{R}^3 . Die Abbildungen von Gauss und Weingarten. Die Rolle der zweiten Fundamentalform. Regelflächen. Nulllinien Pfaffscher Formen in \mathbb{R}^2 und Anwendungen. Weitere Aufgaben zu Kapitel 1. — *Riemannsche Geometrie:* Definition und einfache Eigenschaften. Der Levi-Civita-Zusammenhang. Die Methode der Basisfelder (Cartanscher Kalkül). Wechsel des Basisfeldes. Spezialisierung auf den zweidimensionalen Fall. Parallelverschiebung. Geodätische und Exponentialabbildung. Die Schnittkrümmung. Radiale Entwicklung. — *Hyperflächen im Euklidischen Raum:* Grundlegendes über Hyperflächenimmersionen. Die Methode der bewegten Basen. Die Abbildungen von Gauss und Weingarten. Nabelpunktsimmersionen. Isometrie und Kongruenz. Der Kalkül von K. Voss. Die Integralformeln von Minkowski. Globale Kennzeichnungen der Sphären. Der Kongruenzsatz von Cohn-Vossen. — *Der Satz von Gauss-Bonnet:* Der Kalkül von Flanders. Die Chern-Gleichung. Gauss-Bonnet-Chern-Integral und reguläre Nullstellen von Vektorfeldern. Allgemeiner Index und Euler-Charakteristik. Der Integralsatz von Gauss-Bonnet mit Rand. Berechnung der Euler-Charakteristik durch nicht-ausgeartete Funktionen. — *Kovariante Abteilung von Tensorfeldern.* — *Anhänge:* Multilineare Algebra. Differenzierbare Mannigfaltigkeiten.

Noel Glynn LLOYD. — **Degree theory.** — Cambridge tracts in mathematics, 73. — Un vol. relié, 14 × 22, de x, 172 p. — Prix: £8.50. — Cambridge university press, Cambridge/London/New York/Melbourne, 1978.

Degree theory in finite dimensional spaces: Definition of degree for C^1 functions. Towards a definition for continuous functions. Admitting critical values. Continuous functions. — *Properties of degree in finite dimensional spaces:* Changes in \emptyset and p . Changes in the domain D . The multiplication theorem. Mappings defined on manifolds. — *Some topological applications:* The Brouwer fixed point theorem. Odd mappings. The Jordan separation theorem. — *Leray-Schauder degree:* Introductory remarks.

Definition of the Leray-Schauder degree. Properties of the Leray-Schauder degree. Fixed point theorems. — *Axiomatic treatment*: Axioms for degree theory. General theory. The uniqueness of the Leray-Schauder degree. — *Condensing maps and k -set contractions*: Measure of non-compactness. Degree for condensing maps. Fixed point theorems. — *Generalised degree*: Intertwined representations. A-proper mappings. Multivalued mappings. — *Differentiable mappings*: Calculation of degree. Another definition of degree. — *Some applications of degree theory*: Periodic solutions (I). Periodic solutions (II). Holomorphic mappings and differential equations. Boundary value problems. Bifurcation theory. Other applications.

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Klassisches Korpuskel-Bild. — Klassisches Wellenfeld-Bild. — Grundlagen der Quantenmechanik eines Teilchens. — Der Drehimpuls I. — Streuung an einem Zentralpotential. — Gebundene Zustände in einem Zentralpotential. — Mathematischer Formalismus der Quantenmechanik. — Allgemeine Formulierung der Grundlagen der Quantenmechanik. — Der Drehimpuls II. — Grundlagen der Quantenmechanik für Mehr-Teilchen-Probleme. — Nichtrelativistische Quantenfeldtheorie. — Symmetrien und Invarianzen. — Theorie der Streuprozesse. — Näherungsrechnungen I. — Näherungsrechnungen II.

V. BARBU. and Th. PRECUPANU. — **Convexity and optimization in Banach spaces**. — Un vol. broché, 15 × 21, de XI, 316 p. — Prix: DFL 60.00. — Sijthoff & Noordhoff, Alphen aan den Rijn (published in cooperation with) Editura Academiei, Bucuresti, 1978.

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William J. GILBERT. — **Modern algebra with applications**. — Un vol. relié, 16 × 24, de XII, 348 p. — Prix: £ 15.60. — John Wiley & Sons, New York/London/Sydney/Toronto, 1976.

Introduction: Classical algebra. Modern algebra. Binary operations. Algebraic structures. Extending number systems. — *Boolean algebras*: Algebra of sets. Number of elements in a set. Boolean algebras. Switching circuits. Posets and lattices. Normal forms and simplification of circuits. Transistor gates. Representation theorem. — *Groups*: Groups and symmetries. Subgroups. Cyclic groups and dihedral groups. Morphisms. Permutation groups. Even and odd permutations. Cayley's representation theorem. — *Quotient groups*: Equivalence relations. Cosets and Lagrange's theorem. Normal subgroups and quotient groups. Morphism theorem. Direct products. Group of low order. Action of a group on a set. — *Symmetry groups in three dimensions*: Translations and the Euclidean group. Matrix groups. Finite groups in two dimensions. Proper rotations of regular solids. Finite rotation groups in three dimensions. Crystallographic groups. — *Polya-Burnside method of enumeration*: Burnside's theorem. Necklace problems. Coloring polyhedra. Counting switching circuits. — *Monoids and machines*: Monoids and semi-groups. Finite-state machines. Quotient monoids and the monoid of a machine. — *Rings and fields*: Rings. Integral domains and fields. Subrings and morphisms of rings. New rings from old. Field of fractions. Convolution fractions. — *Polynomial and Euclidean rings*: Division algorithm. Euclidean algorithm. Unique factorization. Factoring real and complex polynomials. Factoring rational and integral polynomials. Factoring polynomials over finite fields. Linear congruences and the Chinese remainder theorem. — *Quotient rings*: Ideals and quotient rings. Computations in quotient rings. Morphism theorem. Quotient polynomial rings that are fields. — *Field extensions*: Field extensions. Algebraic numbers. Galois fields. Primitive elements. — *Latin squares*: Latin squares. Orthogonal Latin squares. Finite geometries. Magic squares. — *Geometrical constructions*: Constructible numbers. Duplicating the cube. Trisecting an angle. Squaring the circle. Constructing regular polygons. A non-constructible number of degree four. — *Error-correcting codes*: The coding problem. Simple codes. Polynomial representation. Matrix representation. Error correcting and decoding. BCH codes. — *Answers to odd-numbered exercises*. — *Glossary of symbols*.

Donald S. PASSMAN. — **The algebraic structure of group rings**. — Pure and applied mathematics. — Un vol. relié, 16 × 24, de XIV, 720 p. — Prix: £24.65. — John Wiley & Sons, New York/London/Sydney/Toronto, 1977.

INTRODUCTION: *Group rings*: Definitions. Twisted group rings. Tensor products. — *The trace map*: Complex idempotents. Places. The power map. Finite groups. — *The augmentation ideal*: Augmentation annihilators. Injective modules. Filtrations in characteristic p . Filtrations in characteristic 0 . — *LINEAR IDENTITIES*: *The center*: Finite conjugate groups. The basic reductions. Idempotents and annihilators. The classical ring of quotients. The maximal ring of quotients. — *Polynomial identities*: Standard identities. Subsets of finite index. Primitive P.I. algebras. Central polynomials. — *Bounded representation degree*: Large centralizers. Finite groups with *r.b.n.* Semiprime P.I. algebras. Matrix embedding. — *The semisimplicity problem*: Nondenumerable fields. Finite

extensions. Abelian extensions and separable algebras. Semisimple rings. — *The nilpotent radical*: The controller subgroup. The N^* -radical. A conjecture. Radical ideals and intersection theorems. — *Primitive rings*: Extensions and the center. Some basic constructions. Normal abelian subgroups. Simple augmentation ideals. — FINITENESS PROPERTIES: *Chain conditions*: Artinian rings. Noetherian rings. Homological dimension. Goldie rings. — *Nilpotent groups*: Dimension subgroups. The Artin-Rees property. Hypercentral rings. Ideal correspondence. — *Finite dimensional modules*: Solvable and finite linear groups. Philip Hall's problem. Some residually finite groups. Finite endomorphism dimension. — *The zero divisor problem*: Unique product groups. — Ordered groups. Supersolvable groups. Polycyclic-by-finite groups. — *Isomorphism questions*: Central subfields. Finite metabelian groups. Infinite abelian groups. Fields of the first kind.

M. E. SZABO. — **Algebra of proofs**. — Studies in logic and the foundations of mathematics, vol. 88. — Un vol. relié, 16 × 23, de XII, 297 p. — Prix: DFL 100.00. — North-Holland publishing company, Amsterdam/New York/Oxford, 1978.

Introduction: Categorical preliminaries. Logical preliminaries. — *Monoidal categories*. — *Symmetric monoidal categories*. — *Cartesian categories*. — *Distributive bicartesian categories*. — *Monoidal closed categories*. — *Symmetric monoidal closed categories*. — *Cartesian closed categories*. — *Bicartesian closed categories*. — *Residuated categories*. — *Monoidal biclosed categories*. — *Quantifier-complete categories*. — *Appendix A*: The labelled deductive system $\Delta(X)$. — *Appendix B*: The unlabelled deductive system $\Delta(X)$. — *Appendix C*: The cut elimination algorithm. — *Appendix D*: The normalization algorithm. (Definition et Exemples en tête de chaque chapitre).

Thomas A. WHITELAW. — **An introduction to abstract algebra**. — Un vol. broché, 15 × 22, de IX, 166 p. — Prix: £4.95. — Blackie and Son, Ltd., Glasgow/London, 1978.

Sets and logic. — Some properties of \mathbf{Z} . — Equivalence relations and equivalence classes. — Mappings. — Semigroups. — An introduction to groups. — Cosets and Lagrange's theorem on finite groups. — Homomorphisms, normal subgroups, and quotient groups. — Rings. — Bibliography. — Appendix to exercises. — Index. (Exercices à la fin de chaque chapitre).

Philippe G. CIARLET. — **The finite element method for elliptic problems**. — Studies in mathematics and its applications, vol. 4. — Un vol. relié, 15,5 × 23, de XVII, 530 p. — Prix: DFL 130.00. — North-Holland publishing company, Amsterdam/New York/Oxford, 1978.

General plan and interdependence table. — *Elliptic boundary value problems*: Abstract problems. Examples of elliptic boundary value problems. — *Introduction to the finite element method*: Basic aspects of the finite element method. Examples of finite elements and finite element spaces. General properties of finite elements and finite element spaces. General considerations on convergence. — *Conforming finite element methods for second order problems*: Interpolation theory in Sobolev spaces. Application to second-order problems over polygonal domains. Uniform convergence. — *Other finite element methods for second-order problems*: The effect of numerical integration. A nonconforming method. Isoparametric finite elements. Application to second order problems over curved domains. — *Application of the finite element method to some nonlinear problems*: The obstacle problem. The minimal surface problem. Nonlinear problems of monotone type. — *Finite element methods for the plate problem*: Conforming methods. Nonconforming methods. — *A mixed finite element method*: A mixed finite element method for the

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Sound waves: The wave equation. The speed of sound. Acoustic energy and intensity. The simple source. The acoustic dipole. Compact source regions in general. Compact source regions with dipole far fields. Ripple-tank simulations. Scattering by compact bodies. Quadrupole radiation. Radiation from spheres. Radiation from plane walls. Dissipation of acoustic energy. — *One-dimensional waves in fluids*: Longitudinal waves in tubes and channels. Examples, including elastic tubes and open channels. Transmission of waves through junctions. Propagation through branching systems. Cavities, constrictions, resonators. Linear propagation with gradually varying composition and cross-section. Frictional attenuation. Nonlinear theory of plane waves. Simple waves. Shock waves. Theory of simple waves incorporating weak shock waves. Hydraulic jumps. Nonlinear propagation with gradually varying composition and cross-section. Nonlinear geometrical acoustics. — *Water waves*: Surface gravity waves. Sinusoidal waves on deep water. Sinusoidal waves on water of arbitrary, but uniform, depth. Ripples. Attenuation. Introduction to group velocity. The Fourier analysis of dispersive systems. Energy propagation velocity. Wave patterns made by obstacles in a steady stream. Ship waves. — *Internal waves*: Introduction to internal gravity waves. Combined theory of sound and internal waves. Internal waves in the ocean and in the atmosphere. Introduction to anisotropic dispersion. General theory of ray tracing. Ray tracing in a wind. Steady streaming generated by wave attenuation. Stationary phase in three dimensions. General theory of oscillating sources of waves. Internal waves generated by an oscillating source. Caustics. Wave generation by travelling forcing effects. Waveguides. — *Epilogue*: A variety of waves in fluids. Nonlinear effects on dispersive wave propagation. — *Bibliography*: Some basic texts. Acoustic literature. Water-wave literature. Stratified-fluids literature. A bibliography for the epilogue.

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S. Chowla : L -series and elliptic curves. — *P. Erdős* : Problems and results on combinatorial number theory III. — *C. J. Moreno* : Explicit formulas in the theory of automorphic forms. — *M. B. Nathanson* : Oscillations of bases in number theory and combinatorics. — *A. Selberg* : Remarks on multiplicative functions.

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in two variables. — *M. Eichler* : Theta functions over \mathbf{Q} and over $\mathbf{Q}(\sqrt{q})$. — *M.-F. Vignéras* : Séries thêta des formes quadratiques indéfinies. — *S. Gelbart* : Automorphic forms and Artin's conjecture. — *S. Kudla* : Relations between automorphic forms produced by theta-functions. — *F. Hirzebruch* : The ring of Hilbert modular form for real quadratic fields of small discriminant. — *A. N. Andrianov* : On zetafunctions of Rankin type associated with Siegel modular forms.

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series. — Vectors. — Vector calculus. — Functions of several variables. — Gradients; extreme values; differentials. — Double and triple integrals. — Line integrals and surface integrals. — *Appendix A*: Some elementary topics. — *Appendix B*: Some additional proofs. — *Appendix C*: Tables.

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of surfaces: Surfaces in Euclidean space. Ovaloids. The Gauss-Bonnet theorem. Completeness. Conjugate points and curvature. Curvature and the global geometry of a surface. Closed geodesics and the fundamental group. Exercises and some further results.

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integrals. Integrals with respect to parameters. Laplace integrals. Hankel loop integrals. Mellin integrals. Multiple integrals. — *Computer programs*: Programs for the evaluation of Euler integrals, definite integrals, repeated integrals, Barnes integrals and related integrals, Laplace integrals, Mellin integrals, multiple integrals, integrals involving the modified Bessel function of the second kind, convolution integrals.

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Vector bundles: Quasi-vector bundles. Vector bundles. Clutching theorems. Operations on vector bundles. Sections of vector bundles. Algebraic properties of the category of vector bundles. Homotopy theory of vector bundles. Metrics and forms on vector bundles. — *First notions of K-theory*: The Grothendieck group of a category. The group $K(X)$. The Grothendieck group of a functor. The group $K(X, Y)$. The group K^{-1} of a Banach category. The group $K^{-1}(X)$. The groups $K^{-n}(X)$ and $K^{-n}(X, Y)$. Multiplicative structures. — *Bott periodicity*: Periodicity in complex K -theory. First applications of Bott periodicity theorem in complex K -theory. Clifford algebras. The functors $K^{p,q}(\mathcal{C})$. and $K^{p,q}(X)$. The functors $K^{p,q}(X, Y)$ and the isomorphism t . Periodicity in real K -theory. Proof of the fundamental theorem. — *Computation of some K-groups*: The Thom isomorphism in complex K -theory for complex vector bundles. Complex K -theory of complex projective spaces and complex projective bundles. Complex K -theory of flag bundles and Grassmann bundles. K -theory of a product. Complements in Clifford algebras. The Thom isomorphism in real and complex K -theory for real vector bundles. Operations in K -theory. — *Some applications of K-theory*: H -space structures on spheres and the Hopf invariant. The solution of the vector field problem on the sphere. Characteristic classes and the Chern character. The Riemann-Roch theorem and integrality theorems. Applications of K -theory to stable homotopy. (*Exercices et Historical note à la fin de chaque chapitre*).

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The Hilbert manifold of closed curves: Hilbert manifolds. The manifold of closed curves. Riemannian metric and energy integral of the manifold of closed curves. The condition (C) of Palais and Smale and its consequences. — *The Morse-Lusternik-Schnirelmann theory on the manifold of closed curves*: The Lusternik-Schnirelmann theory on ΛM . The space of unparameterized closed curves. Closed geodesics on spheres. Morse theory on ΛM . The Morse complex. — *The geodesic flow*: Hamiltonian systems. The index theorem for closed geodesics. Properties of the Poincaré map. Appendix by J. Moser: The Birkhoff-Lewis fixed point theorem. — *On the existence of many closed geodesics*: Critical points in ΠM and the theorem of Fet. The theorem of Gromoll-Meyer. The existence of infinitely many closed geodesics. Appendix by J. Sacks: The minimal model for the rational homotopy type of ΛM . Some generic existence theorem. — *Miscellaneous results*: The theorem of the three closed geodesics. Some special manifolds of elliptic type. Geodesics on manifolds of hyperbolic and parabolic type. — *Appendix: The theorem of Lusternik and Schnirelmann*: The space PM and the theorem of Lusternik and Fet. Closed curves without self-intersections on the 2-sphere. The theorem of Lusternik and Schnirelmann.

Ulf GRENANDER. — **Pattern analysis: lectures in pattern theory, vol. 2.** — Applied mathematical sciences, vol. 24. — Un vol. broché, 17 × 25, de viii, 605 p. — Prix: DM 39.00. — Springer-Verlag, New York/Heidelberg/Berlin, 1978.

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R. S. LIPTSER, A. N. SHIRYAYEV. — **Statistics of random processes I: general theory.** — Translated by A. B. Aries. — Applications of mathematics, vol. 5. — Un vol. relié, 17 × 25, de x, 394 p. — Prix: DM 64.80. — Springer-Verlag, New York/Heidelberg/Berlin, 1977.

Introduction. — Essentials of probability theory and mathematical statistics. — Martingales and semimartingales: discrete time. — Martingales and semimartingales: continuous time. — The Wiener process, the stochastic integral over the Wiener process, and stochastic differential equations. — Square integrable martingales, and structure of the functionals on a Wiener process. — Nonnegative supermartingales and martingales, and the Girsanov theorem. — Absolute continuity of measures corresponding to the Ito processes and processes of the diffusion type. — General equations of optimal nonlinear filtering, interpolation and extrapolation of partially observable random processes. — Optimal filtering, interpolation and extrapolation of Markov processes with a countable number of states. — Optimal linear nonstationary filtering.

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Chronology of most relevant scientists mentioned in the text. — *Historical background*: A historical prelude. Biography. Academic background and contemporaries. Bienaymé in the literature. The "Société Philomatique" and the journal "L'Institut". — *Demography and social statistics*: Infant mortality and birth statistics. Life tables. Probability and the law. Insurance and retirement funds. — *Homogeneity and stability of statistical trials*: Varieties of heterogeneity. Bienaymé and Poisson's law of large numbers. Dispersion theory. Bienaymé's test. — *Linear least squares*: Legendre, Gauss, and Laplace. Bienaymé's contribution. Cauchy's role in interpolation theory. Consequences. Bienaymé and Cauchy on probabilistic least squares. Cauchy continues. — *Other probability and statistics*: A limit theorem in a Bayesian setting. Medical statistics. The law of averages. Electoral representation. The concept of sufficiency. A general inequality. A historical note on Pascal. The simple branching process. The Bienaymé-Chebyshev inequality. A test for randomness. — *Miscellaneous writings*: A perpetual calendar. The alignment of houses. The Montyon prize reports. — References to Bienaymé extracted from name indexes of « *Comptes rendus hebdomadaires des séances de l'Académie des sciences* ». — Bienaymé's publications.

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E. Jolivet: Caractérisation et test du caractère agrégatif des processus ponctuels stationnaires sur \mathbf{R}^2 . — *R. Rebolledo:* Sur les applications de la théorie des martingales à l'étude statistique d'une famille de processus ponctuels. — *J. P. Georgan:* Estimation et contrôle des chaînes de Markov sur des espaces arbitraires. — *G. Ruckebush:* Représentations markoviennes de processus gaussiens stationnaires et applications statistiques. — *T. Pham Dinh:* L'adéquation du processus multivariable gaussien continu stationnaire centre de densité spectrale rationnelle. — *E. Pardoux:* Filtrage de diffusions avec conditions frontières: caractérisation de la densité conditionnelle. — *S. Balacheff, G. Dupont, J. P. Raoult:* Application des résultats de convergence de processus multidimensionnels à l'étude des statistiques de rang.

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Statement of the theorem: Characteristic classes. Motivation of the index theorem. Statement of the index theorem. — *Applications of the index theorem:* The de Rham operator. The Dolbeault operator. The Hodge operator. The Dirac operator. — *Outline of the proof:* The ring $K(X)$. The topological index B . Pseudodifferential operators. Construction of the index homomorphism. Proof of the index theorem. — *The Atiyah-Singer fixed point theorem:* The topological G -index B_G . The G -index theorem. The Atiyah-Singer fixed point theorem. — *Applications of the fixed point theorem:* The Lefschetz fixed point theorem. The holomorphic fixed point theorem. The G -signature theorem. The G -spin theorem. — *Appendix:* Classifying spaces. The splitting principle for complex vector bundles. The splitting principle for real vector bundles. The splitting principle and spin bundles. Universal symbols.

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William J. LEVEQUE. — **Fundamentals of number theory.** — Un vol. relié, 17 × 24, de VII, 280 p. — Prix: \$18.40. — Addison-Wesley Publishing Company, Reading, Mass./Menlo Park, Calif./London/Amsterdam/Don Mills, Ont./Sydney, 1977.

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equation. *Quadratic residues*: Introduction. Quadratic residues of primes, and the Legendre symbol. The law of quadratic reciprocity. The Jacobi symbol. Factorization of large integers. — *Number-theoretic functions and the distribution of primes*: Introduction. The Möbius function. The function $[x]$. The symbols “ O ”, “ o ”, “ \ll ” and “ \sim ”. The sieve of Eratosthenes. Sums involving primes. The true order of $\pi(x)$. Primes in arithmetic progressions. Bertrand’s hypothesis. The order of magnitude of φ , σ and τ . Average order of magnitude. Brun’s theorem on twin primes. — *Sums of squares*: Preliminaries. Primitive representations as a sum of two squares. The total number of representations. Sums of three squares. Sums of four squares. Waring’s problem. — *Quadratic equations and quadratic fields*: Legendre’s theorem. Pell’s equation. Algebraic number fields and algebraic integers. Arithmetic in quadratic fields. — *Diophantine approximation*: Farey sequences and Hurwitz’s theorem. Best approximations to a real number. Infinite continued fractions. Quadratic irrationalities. Applications to Pell’s equation and to factorization. Equivalence of numbers. The transcendence of l . — *Appendix*: Factor table. Computer-plotted graphs. Tables of indices. Greek alphabet. List of symbols.

A. KAUFMANN, G. BOULAYE. — **Théorie des treillis en vue des applications**. — Un vol. relié, 17×25 , de 146 p. — Prix: FF 178.00. — Masson, Paris/New York/Barcelone/Milan, 1978.

Présentation générale de la théorie des treillis: Introduction. Notations et rappels ensemblistes. Les configurations ordonnées. Le concept de treillis en tant que configuration. Le concept de treillis en tant que structure algébrique. Demi-treillis. — *Les principaux types de treillis du point de vue algébrique*: Introduction. Treillis modulaire; treillis semi-modulaire. Treillis distributif. Treillis distributif et complété ou treillis de Boole. Treillis vectoriel. Treillis complet. Sous-treillis. — *Les principaux types de treillis en tant qu’ensembles ordonnés*: Introduction. Chaîne. Treillis libres à n générateurs. Sous-treillis et produit de treillis. Fermetures associées aux opérateurs ∇ et Δ dans un treillis. Extension d’un ensemble ordonné. — *Treillis booléens; point de vue algébrique et ordonné*: Introduction. Définition axiomatique d’une algèbre de Boole. Ordre sur une algèbre de Boole. Fonctions booléennes. Equations booléennes.

Aleksey Vasil’evich POGORELOV. — **The Minkowski multidimensional problem**. — Scripta series in mathematics. — Un vol. relié, 15×23 , de 106 p. — Prix: £.9.70. — V. H. Winston & Sons, Washington D. C. (Distributed solely by Halsted press, a division of John Wiley & Sons, New York/Toronto/London/Sydney), 1978.

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Analysis: Logarithmus und Exponentialfunktion. Differentialgleichungen. Komplexwertige Funktionen. Approximation und Iteration. Funktionen von mehreren reellen Veränderlichen. Vektorwertige Funktionen. C^r -Funktionen. — *Vertiefung der Grundlagen*: Kategorien und Funktoren. Mathematische Logik.

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Jean DIEUDONNE, directeur de publication. — **Abrégé d'histoire des mathématiques 1700-1900. Tome 2**: Fonctions elliptiques, analyse fonctionnelle, topologie, géométrie différentielle, probabilités, logique mathématique. — Avec la collab. de Pierre Dugac, W. J. et F. Ellison, Jean Guérindon, Marcel Guillaume, Guy Hirsch, Christian Houzel, Paulette Libermann, Michel Loève, Jean-Luc Verley. — Un vol. relié, 18 × 25, de vii, 469 p. — Prix: FF 272.00 les 2 vol. — Hermann, Paris, 1978.

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méromorphes doublement périodiques. Division des intégrales elliptiques. Transformations. Equation modulaire. Développement des fonctions elliptiques en séries ou en produits infinis. Fonctions thêta. Fonctions de Weierstrass. Multiplication complexe. Courbes elliptiques. Applications des fonctions elliptiques. Fonctions modulaires et fonctions automorphes. — *2^e partie : Intégrales abéliennes* : Le théorème d'Abel. Problème de l'inversion. Fonctions thêta à deux variables. Division et transformation. Travaux de Weierstrass sur les intégrales hyperelliptiques. Travaux de Riemann. La théorie de Weierstrass. Courbes algébriques. Variétés abéliennes. — *L'analyse fonctionnelle* : Introduction. Théorèmes d'existence locaux. Les équations différentielles dans le domaine complexe. Les équations différentielles dans le domaine réel. Les systèmes hamiltoniens. Equations aux dérivées partielles linéaires et théorie spectrale. Espaces métriques. Espaces normés et théorie spectrale. Développements récents. — *Géométrie différentielle* : Introduction. Courbes dans l'espace euclidien à trois dimensions. Etude des surfaces plongées dans l'espace euclidien à trois dimensions, avant Gauss. La contribution de Gauss, à l'étude des surfaces. Les continueurs de Gauss. Riemann et la géométrie à n dimensions. Le calcul tensoriel. Début des connexions. — *Topologie* : Introduction. Topologie générale. Topologie combinatoire. Les débuts de l'homologie. Dualité. Invariance. Travaux de Brouwer. Champs de vecteurs. Structures multiplicatives. Le groupe fondamental et les revêtements. Les groupes d'homotopie et les espaces fibrés. Variétés à trois dimensions. Type simple d'homotopie. CW -complexes. Conclusions. — *Intégration et mesure* : La définition de l'intégrale. Les théorèmes fondamentaux. Mesures de Stieltjes et de Radon. Les mesures « abstraites ». — *Calcul des probabilités* : Introduction. Genèse et période classique. Libération. Vingtième siècle. Ramifications. — *Axiomatique et logique* : Introduction. Le devenir de la méthode axiomatique au XIX^e siècle. Le progrès vers la formalisation et la compréhension de son rôle jusqu'à la fin du XIX^e siècle. La logique mathématique au XIX^e siècle. Grandes idées du XX^e siècle. — Index historique. — Index terminologique. (Bibliographie à la fin de chaque chapitre).

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classifier. Algebraic theories. Geometric theories. Real number objects. — *Theorems of Deligne and Barr*: Points. Spatial toposes. Coherent toposes. Deligne's theorem. Barr's theorem. — *Cohomology*: Basic definitions. Čech cohomology. Torsors. Profinite fundamental groups. — *Topos theory and set theory*: Kuratowski-finiteness. Transitive objects. The equiconsistency theorem. The filterpower construction. Independence of the continuum hypothesis. — *Appendix*: Locally internal categories.

Hans GRAUERT, Ingo LIEB. — **Differential- und Integralrechnung III.** — Integrations-
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Mengen. Treppenfunktionen und Nullmengen. Messbare Funktionen. Beispiele integrier-
barer Funktionen. Mehrfache Integration. Grenzübergänge unter dem Integralzeichen.
— *Alternierende Differentialformen*: Die Grassmannprodukte eines Vektorraumes.
Alternierende Differentialformen. Differenzierbare Abbildungen. Differentialformen
auf zulässigen Mengen. Beispiele und Rechenregeln. Das Poincarésche Lemma. —
Kurven- und Flächenintegrale: Ketten. Der Stokessche Satz. Die Transformationsformel.
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Vektoranalysis: Differentialformen und Vektorfelder im \mathbf{R}^3 . Kurven- und Flächen-
integrale im \mathbf{R}^3 . Veranschaulichung von Differentialformen. — *Anwendungen auf die
Elektrodynamik*: Elektrisches und magnetisches Feld. Ströme. Stromdichte und Erregungs-
größen.

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erwartungstreue Schätzer für σ^2 . Die multivariate Normalverteilung und mit ihr zusammen-
hängende Prüfverteilungen. Die multivariate Normalverteilung. χ^2 , F - und t -Verteilungen.
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Konfidenzbereiche für schätzbare Funktionen. Tests typischer Hypothesen. Simultane
Konfidenzintervalle. Das verallgemeinerte Lineare Modell. — *Ergänzungen zur Regres-
sionsanalyse*: Stochastische Regressoren. Zweistufige Regression. Multikollinearität
und Orthogonalität. Orthogonale Polynome und Polynomiale Regression. Vergleich
zweier Regressionsgeraden. Asymptotische Eigenschaften der Gauss-Markoff-Schätzer
bei vollem Rang. Das Regressionsmodell mit Fehlern in den Variablen. Stochastische
Spezifikation. Funktionale Spezifikation. — *Einige wichtige Modelle der Varianzanalyse*:
Einfachklassifikation. Problemstellung und Modell. Alternative Parametrisierung.
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equations for the problem of natural selection. On the Mendelian coefficients of heredity. The differential equations for the problem of natural selection in the case of mutations on sexual chromosomes. On the singular points of the differential equations in the problem of natural selection. Natural selection and transformation of the species from the mathematical, statistical and biological points of view. — LIFE AND THE EARTH: *V. A. Kostitzin*: Evolution of the atmosphere: organic circulation, glacial periods.

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topics: R. J. Knill: On the index of isolated closed tori. — F. Hegenbarth: An application of the ρ -invariant. — I. J. Dejter: G -transversality to CF^n . — *Open problems*: P. A. Schweitzer (editor): Some problems in foliation theory and related areas.

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Quadratic forms over rings: Definitions. Operations with quadratic and bilinear forms. Subspaces. Hyperbolic spaces. — *Invariants of quadratic forms*: Azumaya algebras. Clifford algebras. — The structure of Clifford algebras. Some computations. Quadratic spaces of lower dimension. — *The orthogonal group*: Notations. The Eichler decomposition of the orthogonal group. Proper automorphisms. Witt's cancellation theorem over semi local rings. Transversality theorems for quadratic forms. — Pfister

spaces over semi local rings: Similarities: Pfister spaces. Isotropic Pfister spaces. Further results on quadratic Pfister spaces. — *Structure of Witt rings*: Introduction. The discriminant map. Some computations. Quadratic separable extensions. An exact sequence of Witt groups. The torsion of $Wq(A)$ and $W(A)$. The local global principle of Pfister. Nilpotent elements in $Wq(A)$ and $W(A)$. An explicite description of $Wq(A)_t$. On the classification of quadratic spaces. The behaviour of $Wq(A)$ by Galois extensions. — *Appendices*: On the level of semi local rings. The u -invariant.

Probability theory on vector spaces. — Proceedings, Trzebieszowice, Poland, September 1977. — Ed. by A. Weron. — Lecture notes in mathematics, vol. 656. — Un vol. broché, 17×25 , de VIII, 274 p. — Prix: DM 27.00. — Springer-Verlag, Berlin/Heidelberg/New York, 1978.

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Arthur L. BESSE. — **Manifolds all of whose geodesics are closed.** — Ergebnisse der Mathematik und ihrer Grenzgebiete, vol. 93. — Un vol. relié, $17,5 \times 25$, de IX, 262 p. — Prix: DM 78.00. — Springer Verlag, Berlin/Heidelberg/New York, 1978.

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Introduction générale aux problèmes de temps d'arrêt optimal : Orientation. Description formelle des problèmes de temps d'arrêt. Caractérisation analytique par la programmation dynamique. Exemples de problèmes de temps d'arrêt optimal. Problèmes de temps d'arrêt optimal et problèmes de frontière libre. Généralisations. Différentes caractérisations de la fonction coût optimal. — *Equations différentielles stochastiques et équations aux dérivées partielles linéaires du 2^e ordre* : Rappels sur le calcul des probabilités et la théorie des processus stochastiques. Intégrales stochastiques. Equations différentielles stochastiques: formulation forte. Equations différentielles stochastiques: formulation faible. Equations aux dérivées partielles linéaires elliptiques du 2^e ordre. Equations aux dérivées partielles linéaires du second ordre de type parabolique. Interprétation probabiliste de la solution des problèmes aux limites du 2^e ordre. Processus de Markov associé à la solution d'une équation différentielle stochastique. — *Problèmes de temps d'arrêt optimal et inéquations variationnelles* : I. V. stationnaires. Inéquations variationnelles d'évolution. Problèmes de temps d'arrêt optimal. Cas stationnaire. Problèmes de temps d'arrêt optimal. Cas d'évolution. Jeux différentiels stochastiques avec temps d'arrêt. — *Problèmes de temps d'arrêt et de contrôle optimal stochastique* : Contrôle par « variable continue » et par temps d'arrêt. Rappels sur l'équation de Hamilton-Jacobi. Inéquation de Hamilton-Jacobi. Opérateur non sous forme divergence. Inéquations variationnelles de Hamilton-Jacobi. Contrôle sur les coefficients de plus haut degré. Contrôle et temps d'arrêt optimaux avec croissance polynomiale. Le principe de séparation.

Wilhelm R. GLASER. — **Varianzanalyse.** — Uni-Taschenbücher 584. — Un vol. broché, 12 × 18,5, de XIV, 341 p. — Prix: DM 19.80. — Gustav Fischer Verlag, Stuttgart/New York, 1978.

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Avant-propos. — Nombres premiers, fonctions arithmétiques, crible de Selberg. — Théorie additive. — Séries rationnelles. — Théorie algébrique. — Répartition modulo 1. —

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