

AVRIL 2008

CONCOURS INGÉNIEURS DES TRAVAUX STATISTIQUES

TES Voies B Options Mathématiques

Corrigé de la 1^{ère} Composition de Mathématiques

Partie I : Les polynômes de Legendre

1. (a) $(x^2 - 1)^n$ est un polynôme de degré $2n$ de coefficient dominant 1 et L_n est un dérivé ^{au sens degré}.

L_n est un polynôme de degré n de coefficient dominant $2n(2n-1)\cdots(2n-n+1) = \frac{(2n)!}{n!}$

(14)

$$L_0(x) = (x^2 - 1)^0 = 1$$

$$L_1(x) = (x^2 - 1)^1 = x^2 - 1 \quad 20$$

$$L_2(x) = (x^2 - 1)^2 = x^4 - 2x^2 + 1 \quad 12x^2 - 4$$

$$L_3(x) = (x^2 - 1)^3 = x^6 - 3x^4 + 3x^2 - 1 \quad 6x \times 5 \times 4x^2 - 3 \times 4 \times 3 \times 2x = 120x^3 - 72x$$

- (a) Pour tout n , $(x^2 - 1)^n$ est un polynôme pair-impair, pair à pair ($k \leq 2n$), $\sum_{k=0}^{2n} (x^2 - 1)^k$ est un polynôme pair, et pour k impair, $\sum_{k=0}^{2n} (x^2 - 1)^k$ est un polynôme impair. En particulier, $[L_n]$ a la même parité que n .
- (d) Démonstration par récurrence. On a $L_0(1) = 1 = 2^0 + 0$, l'assertion est vraie pour $n = 0$. Supposons que $L_{n-1}(1) = 2^{n-1}(n-1)!$. En appliquant la formule de Leibnitz et en remarquant que toutes les dérivées premières et secondes de $(x^2 - 1)$ ne sont pas nulles :

$$\begin{aligned} (x^2 - 1)(x^2 - 1)^{n-1} &= \sum_{k=0}^n C_n^k x^k - 1(x^{2n} - 1)x^{n-1} \\ &= x^2 - 1(x^{2n} - 1)x^{n-1} + C_n^2 x^2 - 1x^2(x^2 - 1)^{n-1} \\ &\quad + C_n^3 x^3 - 1x^3(x^2 - 1)^{n-1} \\ &= x^2 - 1(x^{2n} - 1)x^{n-1} + C_n^2 2x(x^2 - 1)^{n-1} \\ &\quad + C_n^3 3(x^2 - 1)^{n-1} \end{aligned}$$

D'autre part, d'après la caractérisation des racines multiples à l'aide des dérivées successives, 1 est racine simple de $((x^2 - 1)^{n-1})^{(n-1)}$ car 1 est racine de multiplicité

Polynomes Et Fonctions De Legendre 48

Paul Appell



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Satellites Michel Capderou, 2002-10-02 Ce livre traite des orbites des satellites et montre comment leur grande diversité permet de répondre aux besoins de domaines aussi différents que les communications le positionnement la télédétection la météorologie ou l'astronomie L'ouvrage débute par une étude du satellite dans le cadre des lois de la mécanique spatiale Il présente ensuite les diverses catégories d'orbites et le problème de l'échantillonnage Il s'achève sur des études de cas concrets L'exposé est appuyé par de nombreuses applications figures et illustrations Le CD fourni comporte un logiciel interactif permettant de déterminer l'orbite et l'échantillonnage d'un satellite

History of Continued Fractions and Padé Approximants Claude Brezinski, 2012-12-06 The history of continued fractions is certainly one of the longest among those of mathematical concepts since it begins with Euclid's algorithm for the greatest common divisor at least three centuries B C As it is often the case and like Monsieur Jourdain in Molière's *Le bourgeois gentilhomme* who was speaking in prose though he did not know he was doing so continued fractions were used for many centuries before their real discovery The history of continued fractions and Padé approximants is also quite important since they played a leading role in the development of some branches of mathematics For example they were the basis for the proof of the transcendence of π in 1882 an open problem for more than two thousand years and also for our modern spectral theory of operators Actually they still are of great interest in many fields of pure and applied mathematics and in numerical analysis where they provide computer approximations to special functions and are connected to some convergence acceleration methods Continued fractions are also used in number theory computer science automata electronics etc

Discretisations variationnelles de problèmes aux limites elliptiques Christine Bernardi, Yvon Maday, Francesca Rapetti, 2004-04-06 L'analyse numérique de deux types de discrétisations variationnelles est effectuée en détail pour des problèmes elliptiques les méthodes spectrales et les méthodes d'éléments finis Les avantages de chaque type sont mis en valeur et leur mise en œuvre est décrite L'originalité de cet ouvrage est d'insérer ces deux types de discrétisation dans un cadre abstrait commun ce qui permet au lecteur d'appréhender l'approche bien d'autres méthodes et problèmes Sont présentés également un algorithme pour coupler ces méthodes dans un cadre de décomposition de domaine et une application aux écoulements de fluides incompressibles dans des milieux poreux L'ouvrage s'adresse aux étudiants de 3^{ème} cycle en mathématiques appliquées et mécanique ainsi qu'à tous les ingénieurs intéressés par la simulation numérique

Fonctions hypergéométriques et hypersphériques Paul Appell, Joseph Kampé de Fériet, 1926 **Traité de mécanique rationnelle: Figures d'équilibre d'une masse liquide homogène en rotation sous l'attraction newtonienne de ses particules. Leçon publiée avec le concours de M. Vernet. 1921** Paul Appell, 1921 **Notice sur les travaux mathématiques de Eugène-Charles Catalan** Paul Mansion, 1896 [Traité de mécanique rationnelle](#) Paul Appell, 1921 **Propriétés magnétiques générales de divers composés des éléments du groupe du fer** Jean

Becquerel, 1947-01-01 T00:00:00+01:00 Cet ouvrage est une réédition numérique d'un livre paru au XX^e siècle d'aujourd'hui

indisponible dans son format d'origine Méthodes numériques et optimisation Jean-Pierre Corriou, 2022-10-18 Cet ouvrage présente une synthèse de l'essentiel des méthodes numériques et d'optimisation sous un angle théorique et pratique Chaque chapitre présente les méthodes de manière progressive Chacune des méthodes est systématiquement associée des exemples et des exercices Il s'adresse aux étudiants en universités et écoles d'ingénieurs ainsi qu'aux enseignants chercheurs et ingénieurs

Mécanique quantique Albert Messiah, 1959 *The H-Function* A.M. Mathai, Ram Kishore Saxena, Hans J.

Haubold, 2009-10-10 The H function or popularly known in the literature as Fox sH function has recently found applications in a large variety of problems connected with reaction diffusion reaction diffusion engineering and communication fractional differential and integral equations many areas of theoretical physics statistical distribution theory etc One of the standard books and most cited book on the topic is the 1978 book of Mathai and Saxena Since then the subject has grown a lot mainly in the fields of applications Due to popular demand the authors were requested to grade and bring out a revised edition of the 1978 book It was decided to bring out a new book mostly dealing with recent applications in statistical distributions pathway models nonextensive statistical mechanics astrophysics problems fractional calculus etc and to make use of the expertise of Hans J Haubold in astrophysics area also It was decided to confine the discussion to H function of one scalar variable only Matrix variable cases and many variable cases are not discussed in detail but an insight into these areas is given When going from one variable to many variables there is nothing called a unique bivariate or multivariate analogue of a given function Whatever be the criteria used there may be many different functions qualified to be bivariate or multivariate analogues of a given univariate function Some of the bivariate and multivariate H functions currently in the literature are also questioned by many authors Revue Semestrielle Des Publications Mathématiques , 1923 *Revue Semestrielle Des Publications*

Mathématiques , 1893 Traité de mécanique rationnelle: fasc. 2. Figures d'équilibre d'une masse liquide homogène en rotation. Figure de la terre et des planètes Paul Appell, 1921 **Polynomial expansions of analytic functions** Ralph P.

Boas, Robert Creighton Buck, 2013-06-29 This monograph deals with the expansion properties in the complex domain of sets of polynomials which are defined by generating relations It thus represents a synthesis of two branches of analysis which have been developing almost independently On the one hand there has grown up a body of results dealing with the more or less formal properties of sets of polynomials which possess simple generating relations Much of this material is summarized in the Bateman compendia ERDELYI 1 vol III chap 19 and in TRUESDELL 1 On the other hand a problem of fundamental interest in classical analysis is to study the representability of an analytic function $f(z)$ as a series $\sum c_p z^p$ where p is a prescribed sequence of functions and the connections between the function f and the coefficients c BIEBERBACH's monograph *Analytische Fortsetzung Ergebnisse der Mathematik* new series no 3 can be regarded as a study of this problem for the special choice $p = z$ and illustrates the depth and detail which such a specialization allows However the wealth of available information about other sets of polynomials has seldom been put to work in this connection the application of

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Interpolation Processes Giuseppe Mastroianni,Gradimir Milovanovic,2008-08-24 Interpolation of functions is one of the basic part of Approximation Theory There are many books on approximation theory including interpolation methods that peared in the last fty years but a few of them are devoted only to interpolation processes An example is the book of J Szabados and P V rtesi Interpolation of Functions published in 1990 by World Scienti c Also two books deal with a special interpolation problem the so called Birkhoff interpolation written by G G Lorentz K Jetter S D Riemenschneider 1983 and Y G Shi 2003 The classical books on interpolation address numerous negative results i e sultsondivergentinterpolationprocesses usuallyconstructedoversomeequidistant system of nodes The present book deals mainly with new results on convergent terpolation processes in uniform norm for algebraic and trigonometric polynomials not yet published in other textbooks and monographs on approximation theory and numerical mathematics Basic tools in thiseld orthogonal polynomials moduli of smoothness K functionals etc as well as some selected applications in numerical integration integral equations moment preserving approximation and summation of slowly convergent series are also given The rstchapterprovidesanaccountofbasicfactsonapproximationbyalgebraic and trigonometric polynomials introducing the most important concepts on appro mation of functions Especially in Sect 1 4 we give basic results on interpolation by algebraic polynomials including representations and computation of interpolation polynomials Lagrange operators interpolation errors and uniform convergence in some important classes of functions as well as an account on the Lebesgue function and some estimates for the Lebesgue constant

Research in History and Philosophy of Mathematics Maria Zack,Elaine Landry,2015-11-10 This volume contains thirteen papers that were presented at the 2014 Annual Meeting of the Canadian Society for History and Philosophy of Mathematics La Soci t Canadienne d Histoire et

de Philosophie des Mathématiques held on the campus of Brock University in St Catharines Ontario Canada It contains rigorously reviewed modern scholarship on general topics in the history and philosophy of mathematics as well as on the meeting s special topic Early Scientific Computation These papers cover subjects such as Physical tools used by mathematicians in the seventeenth century The first historical appearance of the game theoretical concept of mixed strategy equilibrium George Washington s mathematical cyphering books The development of the Venn diagram The role of Euler and other mathematicians in the development of algebraic analysis Arthur Cayley and Alfred Kempe s influence on Charles Peirce s diagrammatic logic The influence publishers had on the development of mathematical pedagogy in the nineteenth century A description of the 1924 International Mathematical Congress held in Toronto told in the form of a narrated slide show Written by leading scholars in the field these papers will be accessible to not only mathematicians and students of the history and philosophy of mathematics but also anyone with a general interest in mathematics *Mécanique quantique. 1* Albert Messiah,1962 Sur les fonctions hypergeometriques de plusieurs variables... Paul Emile Appell,1925

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