CATALOGAREA ELEMENTELOR MATEMATICE

Codruț Sorin Zmicală

Catalogarea elementelor matematice pentru:

- Șiruri
- Curbe
- Matematicieni
- Ecuații diferențiale și integrale

The On-Line Encyclopedia of Integer Sequences(OEIS)

https://oeis.org/wiki/Welcome

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Welcome

This is the stable version, approved on *18 April 2019*. (+)

NOTE: The **Main Page** on the OEIS Wiki has much more information (FAQ, Index, Style Sheet, Trouble Logging In, Citations, etc.)

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Numerele Fibonacci

Sunt definite prin următoarea relație de recurență:

$F_0 = 0, F_1 = 1, F_i = F_{I-1} + F_{i-2}$, pentru $i \geq 2$.

Astfel, fiecare număr Fibonacci este suma celor două numere Fibonacci anterioare, rezultând secvența:

$0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, \ldots$

Această secvență de numere poartă numele de ***șirul lui Fibonacci***.

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THE ON-LINE ENCYCLOPEDIA OF INTEGER SEQUENCES®

founded in 1964 by N. J. A. Sloane

fibonacci numbers Search Hints

(Greetings from The On-Line Encyclopedia of Integer Sequences!)

Search: **fibonacci numbers**

Displaying 1-10 of 6414 results found. page 1 2 3 4 5 6 7 8 9 10 ... 642

Sort: relevance | references | number | modified | created Format: long | short | data

A000045 **Fibonacci numbers**: F(n) = F(n-1) + F(n-2) with F(0) = 0 and F(1) = 1. +40 4656

(Formerly M0692 N0256)

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987, 1597, 2584, 4181, 6765, 10946, 17711, 28657, 46368, 75025, 121393, 196418, 317811, 514229, 832040, 1346269, 2178309, 3524578, 5702887, 9227465, 14930352, 24157817, 39088169, 63245986, 102334155 (list; graph; refs; listen; history; text; internal format)

OFFSET 0,4

COMMENTS Also sometimes called Lamé's sequence.
F(n+2) = number of binary sequences of length n that have no consecutive 0's.
F(n+2) = number of subsets of {1,2,...,n} that contain no consecutive integers.
F(n+1) = number of tilings of a 2 X n rectangle by 2 X 1 dominoes.
F(n+1) = number of matchings (i.e., Hosoya index) in a path graph on n vertices: F(5)=5 because the matchings of the path graph on the vertices A, B, C, D are the empty set, {AB}, {BC}, {CD} and {AB, CD}. - Emeric Deutsch, Jun 18 2001
F(n) = number of compositions of n+1 with no part equal to 1. [Cayley, Grimaldi]
Positive terms are the solutions to z = 2*x*y^4 + (x^2)*y^3 - 2*(x^3)*y^2 - y^5 - (x^4)*y + 2*y for x,y >= 0 (Ribenboim, page 193). When x=F(n), y=F(n + 1) and z > 0 then z=F(n + 1).
For Fibonacci search see Knuth, Vol. 3; Horowitz and Sahni; etc.

ENCYCLOPÉDIE DES FORMES MATHÉMATIQUES REMARQUABLES

https://www.mathcurve.com/

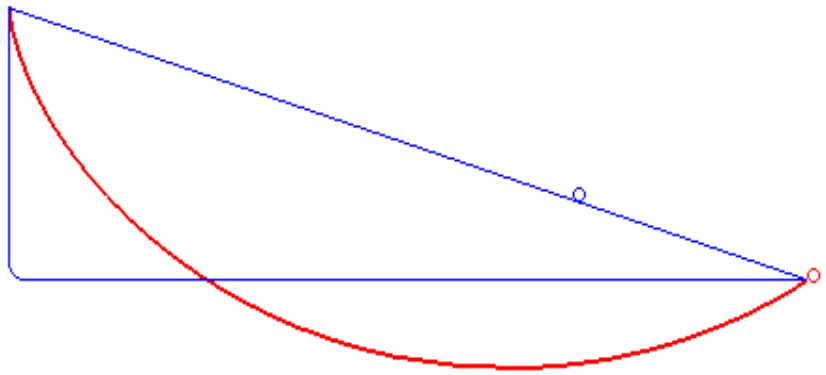
ENCYCLOPÉDIE DES FORMES MATHÉMATIQUES REMARQUABLES

Prix Anatole Decerf 2008

Nouveautés au 15/ 08 / 2018 :

Zomes hélices
Hélices de l'hyperboloïde
Cercles géodésiques
Surface développable pliée
Dôme de Bohème
Roulettes d'ellipses
Surfaces hélico-coniques
Le fractal de Polya
Les poissons

Un exemple pour voir :



Ce site sur les formes mathématiques est issu d'un petit résumé commencé en 1993, destiné à des élèves de math sup désireux d'avoir un récapitulatif des courbes classiques dont quelques exemples parsemaient mon cours.

Ce résumé a commencé à prendre du volume, et j'ai pensé que bien que le sujet ne soit pas particulièrement à la mode, il pourrait intéresser, d'où ce site.
Les courbes et les surfaces m'ont fait découvrir pas mal de trésors connus de nos prédécesseurs et que nous avons tendance à oublier. J'ai

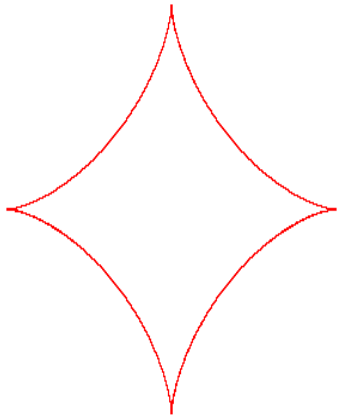
Astroida

Este curba generată de un cerc cu raza de $\frac{1}{4}$ se învârte în interiorul unui cerc de rază 1.

https://www.mathcurve.com/courbes2d.gb/astroid/astroid.shtml

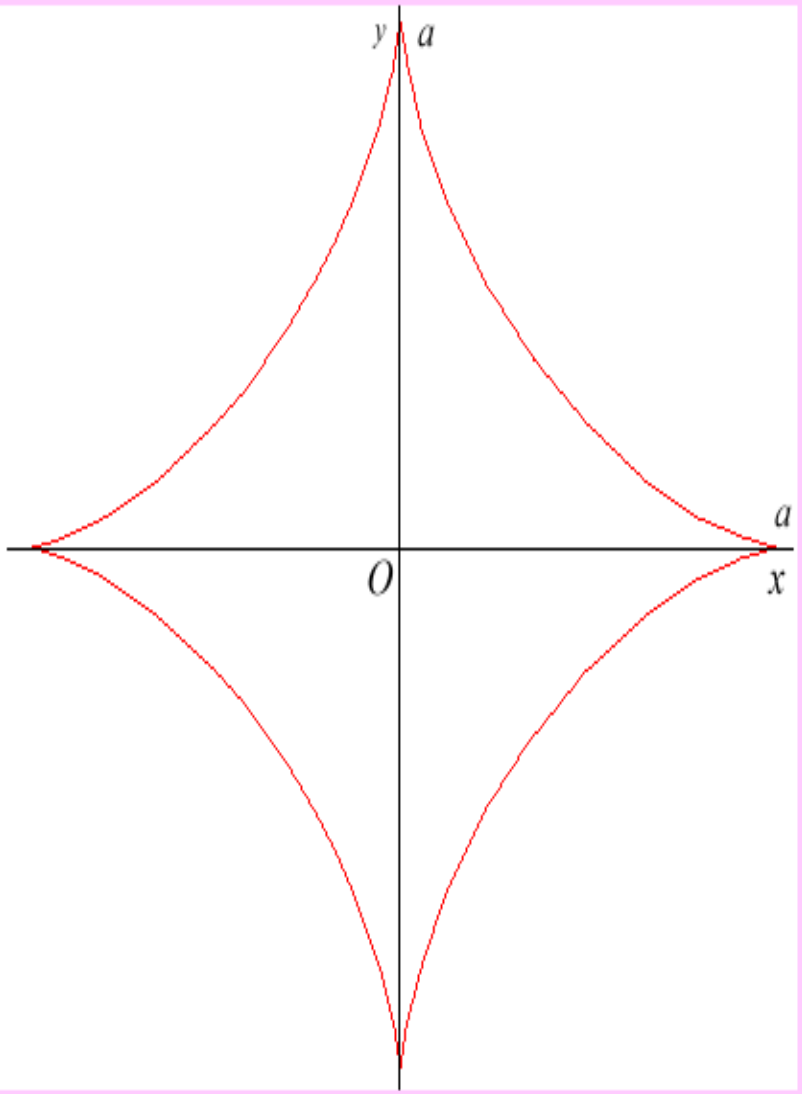
next curve	previous curve	2D curves	3D curves	surfaces	fractals	polyhedra

ASTROID



Curve studied by Rømer in 1674, Jean Bernoulli in 1691, Leibniz in 1715 and D'Alembert in 1748.
Named by Littrow in 1838.
"Astroid" comes from the Greek word "star" : "astron" (like the word *"asteroid"* designing star like objects).

Other names : H_4 (hypocycloid with 4 cusps), cubocycloid.



Parametric equation: $\begin{cases} x = a\cos^3 t \\ y = a\sin^3 t \end{cases}$.

Cartesian equation: $\sqrt[3]{x^2} + \sqrt[3]{y^2} = \sqrt[3]{a^2}$ (Lamé's curve) or $(x^2 + y^2 - a^2)^3 + 27a^2x^2y^2 = 0$.

Rational algebraic curve of degree six.

Complex parametric equation: $4z = a\left(3e^{it} + e^{-3it}\right)$.

Cartesian tangential angle: 1) $\varphi = -t$ or 2) $\varphi = \pi - t$.

Curvilinear abscissa: 1) $s = \frac{3a}{4}\cos 2t$ or 2) $s = \frac{3a}{2}\sin^2 t$.

Radius of curvature: 1) $R_c = \frac{3a}{2}\sin 2t$ or 2) $R_c = -\frac{3a}{2}\sin 2t$.

Cesaro equation: $4s^2 + R_c^2 = \frac{9a^2}{4}$.

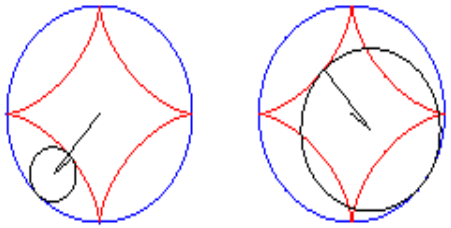
Whewell equation: $s = \frac{3a}{4}\sin^2 \varphi$.

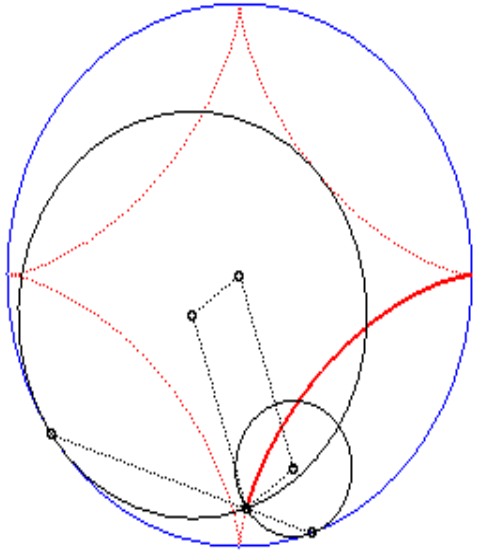
Pedal equation: $\rho^2 + 3p^2 = a^2$.

Length of curve: $6a$.

Area enclosed: $\frac{3}{8}\pi a^2$.

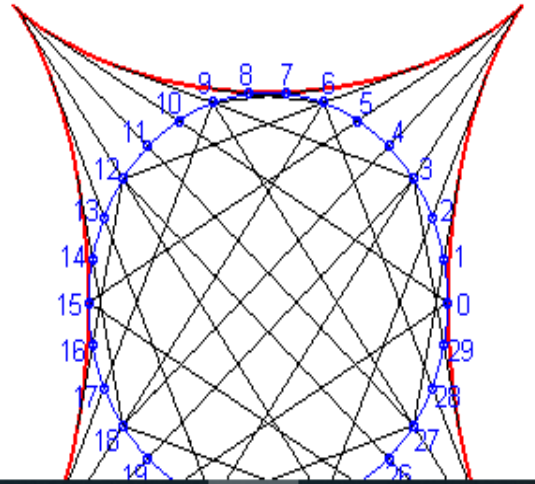
The astroid is a hypocycloid with four cusps (a circle having *a/4* (or *3a/4*) for radius running in a circle (*C*) having *a* for radius).

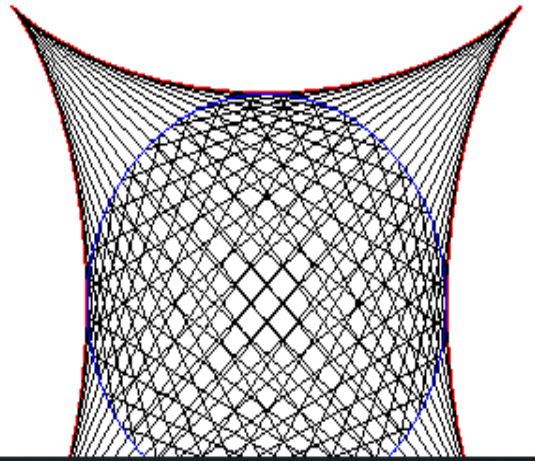


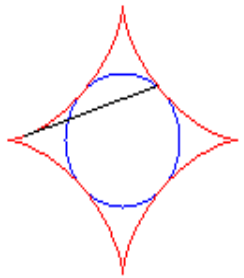


Animation of the double generation

Then, it is the envelope of a chord (*PQ*) of the circle having the center *O* and *a*/2 for radius (inscribed circle of the astroid), *P* and *Q* running on this circle with opposite directions, one being three times faster than the other (Cremona generation).







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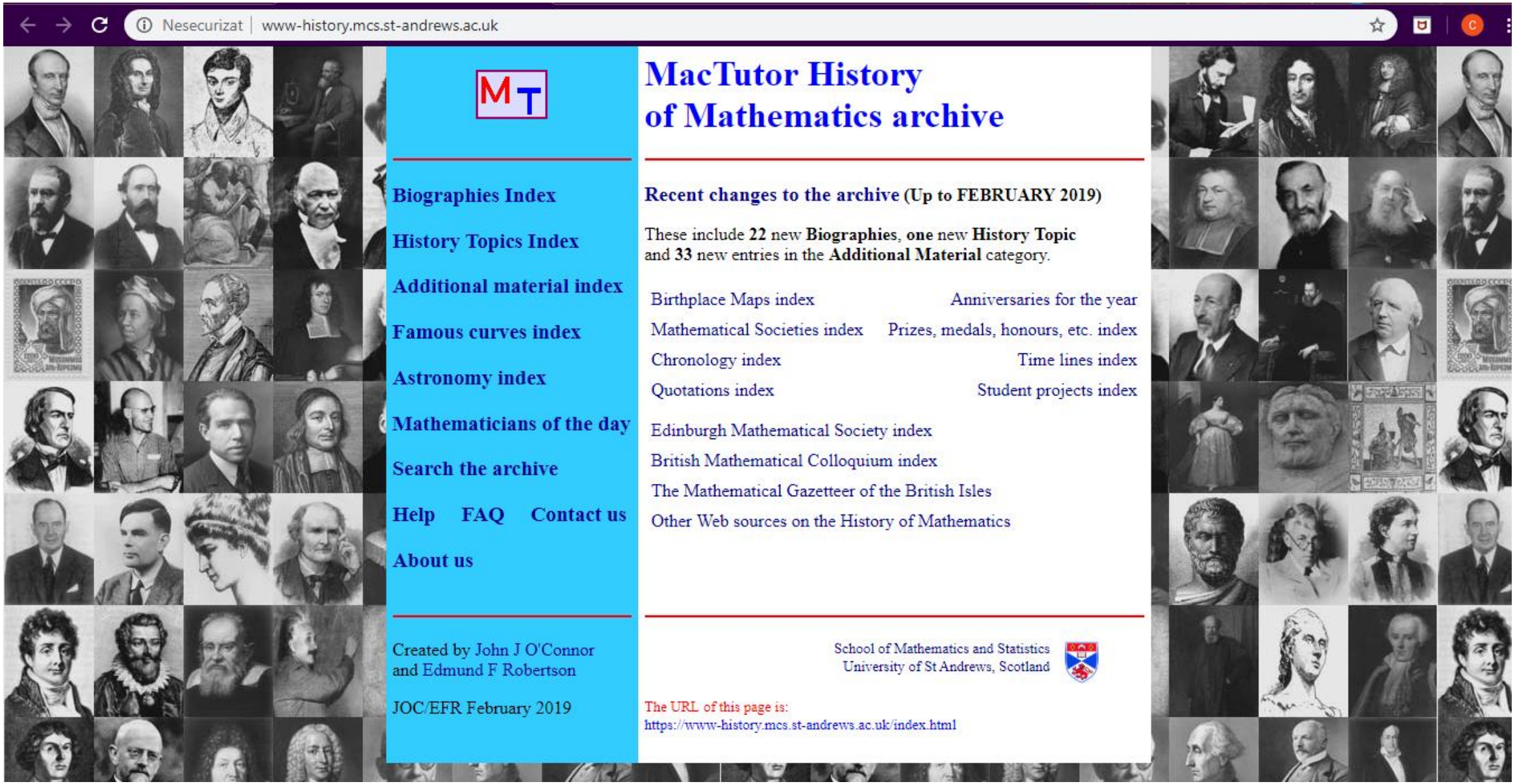
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Other Web sources on the History of Mathematics
School of Mathematics and Statistics
University of St Andrews, Scotland
The URL of this page is:
https://www-history.mcs.st-andrews.ac.uk/index.html

Heinrich Eduard Heine

Born: 16 March 1821 in Berlin, Germany
Died: 21 October 1881 in Halle, Germany

Click the picture above
to see two larger pictures

Show birthplace location

Eduard Heine's parents were Karl Heinrich Heine, a banker, and Henriette Maertens. Eduard was the eighth of his parents nine children. He received his early instruction at home, then entered the Friedrichswerdersche Gymnasium. He later changed to study at the Köllnische Gymnasium in Berlin where mathematics and natural sciences were taught. After his Abitur in the autumn 1838, Heine entered the University of Berlin. After one semester he went to the University of Göttingen where he attended lectures by Gauss and by M A Stern on number theory.

After three semesters at Göttingen, Heine returned to the University of Berlin where he where he was taught by Dirichlet. He also attended geometry lectures by Steiner, and astronomy lectures by J F Encke, the director of the observatory. However, he also got to know the other outstanding mathematicians in Berlin: Weierstrass, Kummer, Kronecker, and Borchardt. Throughout his life he maintained his contacts with these mathematicians, making numerous journeys to Berlin. He remained at Berlin to undertake research which was supervised by Enno Dirksen and Martin Ohm. Heine submitted his thesis *De aequationibus nonnullis differentialibus* ⓘ and was awarded the degree on 30 April 1842. The thesis was dedicated to Dirichlet. Following this he spent a year at Königsberg studying with Jacobi and Franz Neumann. He took part in the Königsberg mathematical semiar which was also attended by Aronhold, Kirchhoff, and Seidel.

The World of Mathematical Equations

http://eqworld.ipmnet.ru/

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EqWorld

The World of Mathematical Equations

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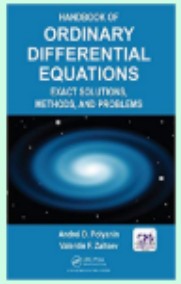
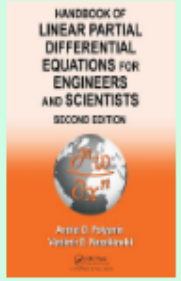
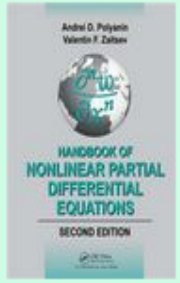
Equations play a crucial role in modern mathematics and form the basis for mathematical modelling of numerous phenomena and processes in science and engineering.

The international scientific-educational website EqWorld presents extensive information on solutions to various classes of ordinary differential, partial differential, integral, functional, and other mathematical equations. It also outlines some methods for solving equations, includes interesting articles, gives







Reglarea temperaturii apei la un duș

De exemplu, ecuația

$$\mathbf{T'_m(t) = -k[T_m(t-h) - T_d]},$$

modelează fenomenul de reglare a temperaturii apei la un duș, unde:

$\boldsymbol{T_d}$ - temperatura dorită a apei

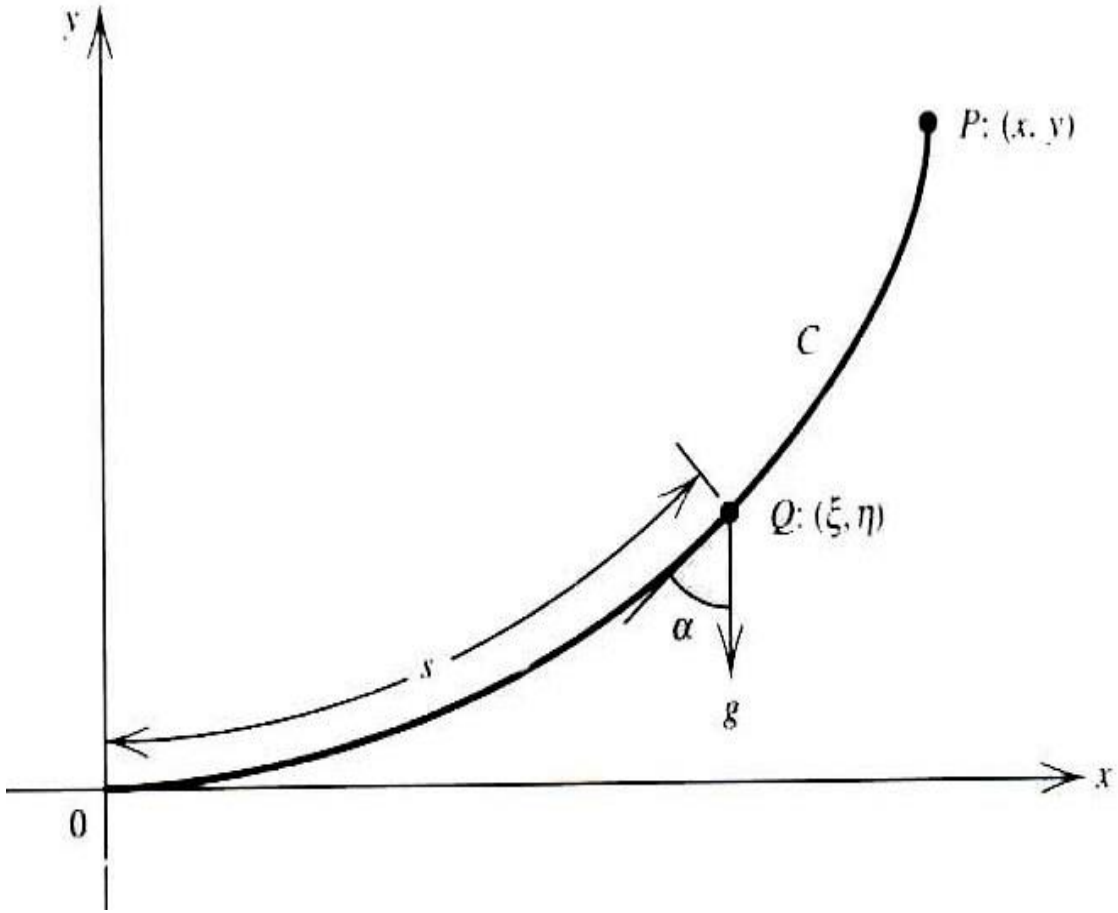
$\mathbf{T_m(t)}$ - temperatura apei la ieșire

$\mathbf{h}$ - timpul necesar apei de a ajunge de la robinet până la om

$\mathbf{k}$ – valoarea raportului dintre variația temperaturii apei și variația unghiului de rotație al robinetului

Problema lui Abel

Găsirea unei curbe, într-un plan vertical, astfel încât un punct material care se deplasează de-a lungul ei, sub influența gravitației, dintr-o poziție de repaus, pentru care timpul de coborâre este o funcție dată, se numește “Problema lui Abel”.



Problema precedentă a fost propusă de N.H. Abel în 1823, iar soluția sa implică una dintre primele ecuații integrale:

$$f(x) = \int_0^x \frac{1}{\sqrt{2g(x-\xi)}} u(\xi) d\xi$$

numită ***ecuația integrală a lui Abel***.

Ecuații integrale cu nucleu degenerat

Considerăm ecuația integrală de speța a doua

$$y(x) = \int_a^b K(x,s)y(s)\,ds + f(x), \qquad (1)$$

$x \in [a,b] \subset \mathbb{R}^n$ și formulăm condițiile în care urmează să studiem această ecuație. Vom face următoarele ipoteze:

- Funcția $K(x,s)$ este numită **nucleul** ecuației integrale (1) și este o funcție continuă pe intervalul $[a,b]$.
- Funcția $f(x)$ este numită **termenul liber** al ecuației integrale (1) și este o funcție continuă pe intervalul $[a,b]$.

Spunem că ecuația integrală (1) *este cu* ***nucleu degenerat****, dacă nucleul* $K(x,s)$ *are forma*

$$K(x,s) = \sum_{i=1}^{n} a_i(x) b_i(s)\,.$$

Presupunem că funcțiile $a_1(x), a_2(x), \dots, a_n(x)$ și $b_1(s), b_2(s), \dots, b_n(s)$ sunt funcții continue pe intervalul $[a,b]$ și liniar independente pe intervalul $[a,b]$.

Căutăm soluția ecuației integrale (1) în mulțimea funcțiilor continue pe intervalul $[a,b]$, pe care o notăm $C[a,b]$.

În cele ce urmează vom arăta că studiul ecuațiilor integrale cu nucleu degenerat se reduce la studiul unor sisteme de ecuații liniare.

Să presupunem că ecuația integrală de speța a doua cu nucleu degenerat posedă o soluție. Atunci pentru această soluție trebuie să avem

$$y(x) = \int_a^b \sum_{i=1}^{n} a_i(x) b_i(s)\, y(s)\, ds + f(x)\,.$$

Știind că funcțiile $a_i(x)$ nu depind de s putem scrie $y(x)$ sub forma

$$y(x) = \sum_{i=1}^{n} a_i(x) \int_a^b b_i(s) y(s)\, ds + f(x). \qquad (2)$$

Pentru $i = \overline{1,n}$, dacă notăm

$$\int_a^b b_i(s)y(s)\,ds = C_i,$$

unde $C_1, C_2, \dots, C_n$ sunt constante, obținem că soluția ecuației integrale (1) este de forma

$$y(x) = \sum_{i=1}^{n} C_i a_i(x) + f(x). \qquad (3)$$

Înlocuind ecuația (3) în ecuația (2) obținem

$$\sum_{i=1}^{n} C_i\, a_i(x) + f(x) = \sum_{i=1}^{n} a_i(x) \int_a^b b_i(s) \left[\sum_{j=1}^{n} C_j a_j(s) + f(s)\right] ds + f(x).$$

În continuare, notând

$$K_{ij} = \int_a^b b_i(s)a_j(s)\,ds, \qquad f_i = \int_a^b b_i(s)f(s)\,ds, \qquad i,j = \overline{1,n}$$

ecuația precedentă se reduce la

$$\sum_{i=1}^{n} a_i(x)\left[C_i - \sum_{j=1}^{n} K_{ij}C_j - f_i\right] = 0,$$

de unde obținem sistemul algebric

$$\begin{cases} (1-K_{11})C_1 = f_1 \\ -K_{21}C_1 + (1-K_{22})C_2 = f_2 \\ -K_{31}C_2 - K_{32}C_2 + (1-K_{33})C_3 = f_3 \\ \vdots \\ -K_{n1}C_1 - K_{n2}C_2 - \cdots + (1-K_{nn})C_n = f_n \end{cases}. \qquad (4)$$

- ✓ Astfel, fiecărei soluții a ecuației integrale (1) cu nucleu degenerat îi corespunde o soluție $(C_1, C_2, \dots, C_n)$ a sistemului de ecuații algebrice (4).

- ✓ Așadar, studiul ecuației integrale de speța a doua a lui Fredholm s-a redus la studiul unui sistem de ecuații algebrice liniare.

Exemplu 1

Să se rezolve ecuația integrală cu nucleu degenerat

$$y(x) = \int_0^1 (x + s)y(s)\,ds + 1.$$

Rescriem $y(x)$ sub forma

$$y(x) = x\int_0^1 y(s)\,ds + \int_0^1 sy(s)\,ds + 1.$$

Notând

$$C_1 = \int_0^1 y(s)ds, \quad C_2 = \int_0^1 sy(s)\,ds$$

obținem că soluția ecuației integrale este de forma

$$y(x) = xC_1 + C_2 + 1.$$

Căutând soluție de această formă suntem conduși la sistemul algebric

$$\begin{cases} C_1 = \int_0^1 (sC_1 + C_2 + 1)\,ds \\ C_2 = \int_0^1 s(sC_1 + C_2 + 1)\,ds \end{cases}$$

echivalent cu

$$\begin{cases} \frac{C_1}{2} - C_2 = 1 \\ -\frac{C_1}{3} + \frac{C_2}{2} = \frac{1}{2} \end{cases}$$

care are soluția $C_1 = -12, C_2 = -7$.

Prin urmare, unica soluție a ecuației integrale este

$$y(x) = -12x - 6.$$

Exemplul 2

Rezolvați ecuația integrală

$$\varphi(x,y) = 2\int_0^1 \int_0^1 (xs + yt)\,\varphi(s,t)\,ds\,dt + 1.$$

Notăm

$$C_1 = \int_0^1 \int_0^1 s\varphi(s,t)\,ds\,dt\,, \qquad C_2 = \int_0^1 \int_0^1 t\varphi(s,t)\,ds\,dt\,.$$

Deci, ecuația admite soluții de forma

$$\varphi(x,y) = 2C_1x + 2C_2y + 1,$$

unde (C_1, C_2) este soluție a sistemului

$$\begin{cases} \frac{1}{3}C_1 - \frac{1}{2}C_2 = \frac{1}{2} \\ -\frac{1}{2}C_1 + \frac{1}{3}C_2 = \frac{1}{2} \end{cases}$$

adică $C_1 = -3, C_2 = -3$.

Prin urmare, soluția ecuației integrale este

$$\varphi(x,y) = 1 - 6x - 6y.$$

Exemplul 3

Să se rezolve ecuația integrală cu nucleu degenerat

$$\varphi(x,y,z) = \int_0^1 \int_0^1 \int_0^1 (xs + yu + zt)\varphi(s,u,t)\, ds\, du\, dt + x + y + z.$$

Căutăm soluții de forma

$$\varphi(x,y,z) = xC_1 + yC_2 + zC_3 + x + y + z,$$

unde C_1, C_2 și C_3 sunt definite în felul următor:

$$C_1 = \int_0^1 \int_0^1 \int_0^1 s\varphi(s,u,t)\, ds\, du\, dt$$

$$C_2 = \int_0^1 \int_0^1 \int_0^1 u\varphi(s,u,t)\, ds\, du\, dt$$

$$C_3 = \int_0^1 \int_0^1 \int_0^1 t\varphi(s,u,t)\, ds\, du\, dt$$

Pentru C_1, C_2, C_3 obținem sistemul algebric

$$\begin{cases} C_1 = \frac{C_1}{3} + \frac{C_2}{4} + \frac{C_3}{4} + \frac{5}{6} \\ C_2 = \frac{C_1}{4} + \frac{C_2}{3} + \frac{C_3}{4} + \frac{5}{6} \\ C_3 = \frac{C_1}{4} + \frac{C_2}{4} + \frac{C_3}{3} + \frac{5}{6} \end{cases}$$

echivalent cu

$$\begin{cases} 8C_1 - 3C_2 - 3C_3 = 10 \\ -3C_1 + 8C_2 - 3C_3 = 10 \\ -3C_1 - 3C_2 + 8C_3 = 10 \end{cases}$$

Sistemul este compatibil determinat și are soluția $C_1 = C_2 = C_3 = 5$. Așadar, soluția ecuației integrale este

$$\varphi(x,y,z) = 6(x + y + z).$$

Vă mulțumesc!