Putting all these inequalities together, we have:

$$F\left(0,\frac{1}{n}\right)>0\Rightarrow f(0)>f\left(\frac{1}{n}\right)$$
$$F\left(\frac{1}{n},\frac{2}{n}\right)>0\Rightarrow f\left(\frac{1}{n}\right)>f\left(\frac{2}{n}\right)$$
$$\cdots$$
$$F\left(\frac{n-1}{n},\frac{n}{n}\right)>0\Rightarrow$$
$$f\left(\frac{n-1}{n}\right)>f\left(\frac{n}{n}\right)=f(1)$$

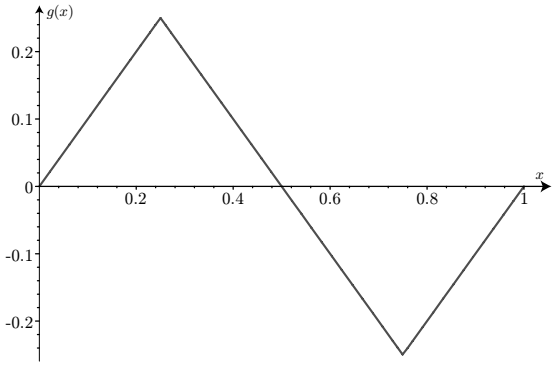
But then, $f(0) > f(1)$, which contradicts the hypothesis of the problem. Consequently, the map F is negative or zero on some the pairs in $\mathcal{C}_n$. Thus, we have the result. We remark the fact that we have been looking for points whose distance to each other is the inverse of a positive integer; this is essential sence, otherwise, the list of points obtained in the argument would not end at 1, which is what we need to contradict the hypothesis of the problem. That is, for lengths different from $1/n$ the given argument is no longer working.

Let us consider now the second part of the problem. The claim is obvious for the inverse of every number between 0 and 1: it is clear that no cord can exist with length $\frac{1}{0.5}=2$ and this is not the interesting case. We shall construct an example concerning the inverse of a number bigger than 1:

Consider the following continuous function on the interval $[0,1]$:

$$g(x)=\begin{cases}x\,, & \text{si } 0\le x\le\frac{1}{4}\\ -x+\frac{1}{2}\,, & \text{si } \frac{1}{4}\le x\le\frac{3}{4}\\ x-1\,, & \text{si } \frac{3}{4}\le x\le 1\end{cases}$$

It clearly satisfies $g(0)=g(1)=0$. So the hypothesis hold, but there are no cords of length bigger than $\frac{1}{2}$ (see the graph of g).



Mathematics PhD theses in Catalonia

Mathematics PhD theses in Catalonia

Three of the Catalan universities offer Mathematics courses, both at undergraduate and at doctorate level. The Faculty of Mathematics of University of Barcelona, the Faculty of Sciences of the Autonomous University of Barcelona and the Faculty of Mathematics and Statistics of the Technical University of Catalonia all have their corresponding doctoral programmes in Mathematics, in which doctors receive ongoing training in the different areas and specialities represented in Catalonia.

The quality of these doctoral programmes has increased considerably in recent years and is currently comparable to that of many of the best European and American universities. The outgoing students are fully initiated and ready to carry out research in their corresponding specialities, as shown by the fact that many of them participate actively in research groups both here and abroad and successfully devote themselves to mathematical research. Furthermore, following the trend of the most prestigious universities, there is a growing interest on the part of companies in the technology and financial sectors in hiring increasing numbers of doctors in Mathematics in order to develop their more specialised work. This is a clear indication of the vitality of our three doctoral programmes and of the usefulness of high-level Mathematics, beyond the realm of pure research.

To give an idea of the subjects dealt with

in the different doctoral theses of recent years, we provide a list of the titles, doctoral students and thesis directors that have been mentioned in *SCM/Notícies* since Number 18. For more information, see the corresponding issue of the journal or contact the coordinators of the corresponding doctoral programme:

- *Evolution of sex-ratio in structured population dynamics*, defended on October 5th, 2005 by Jordi Ripoll i Missé and directed by Àngel Calsina i Ballesta at the University of Barcelona.
- *Hermeneutics of the diferential calculus in the Europe of the XVIII century: from the Analyse des infiniment petits de L'Hôpital (1696) to Traité élémentaire de calcul diffírentiel et de calcul intégral de Lacroix (1802)*, defended on October 28th, 2004 by Mónica Blanco Abellán and directed by Josep Pla i Carrera at the University of Barcelona and Autònoma de Barcelona.
- *Localization and preservation of structures in stable homotopy,* defended on September 10th, 2004 by Javier J. Gutiérrez Marín and directed by Carles Casacuberta at the University of Barcelona.
- *Consecutive and statistic motives in restricted permutations,* defended on July 16th, 2004 by Sergi Elizalde Torrent and directed by Marc Noy Serano at the Technical University of Catalonia.
- *Reducibility of quasi-periodic skew-products and the spectrum of Schrödinger operators,* defended on June 22th, 2004 by Joaquim Puig i Sadurní and directed by Carles Simó i Torres at the University of Barcelona.
- *On linear secret sharing schemes and distributed cryptographic protocols,* defended on June 7th, 2004 by Vanesa Daza Fernández and directed by Carles Padró Laimon at the Technical University of Catalonia.
- *Predictive control systems in irrigation ditches: formulation and numerical simulation,* defended on April 5th, 2004 by Juan Antonio Mantecón Baena and directed by José Rodellar Benedé and Manuel Gómez Valentín at the Technical University of Catalonia.
- *Design and analysis of semantically secure public key encryption schemes,* defended on April 5th, 2004 by David Galindo Chacón and directed by Sebastià Martí Molleví at the Technical University of Catalonia.
- *Localization, proper actions and classifying spaces for discrete groups,* defended on March 19th, 2004 by Ramón Jesús Flores Díaz and directed by Carles Broto Blanco at the Autonomous University of Barcelona.
- *Algorithmic problems on proximity and location under metric constraints,* defended on November 21th, 2003 by Belén Palop del Río and directed by Ferran Hurtado at the Technical University of Catalonia.
- *Distribution models on the simplex,* defended on October 10th, 2003 by Glòria Mateu Figueras and directed by Vera Pawlowsky Glahn and Carles Barceló i Vidal at the Technical University of Catalonia.
- *On symplectic linearization of singular Lagrangian foliations,* defended on September 22th, 2003 by Eva Miranda Galcerán and directed by Carlos Currás Bosch at the University of Barcelona.
- *Adaptive dynamics in an infinite dimensional setting,* defended on July 16th, 2003 by Sílvia Cuadrado Gavilán and directed by Àngel Calsina Ballesta at the Autonomous University of Barcelona.
- *Curvature integrals and integral geometry in the hyperbolic space,* defended on June 27th, 2003 by Gil Solanes Farrés and directed by Eduard Gallego Gómez at the Autonomous University of Barcelona.
- *Algoritms and methods for robust geodetic kinematic positioning,* defended on June 27th, 2003 by Julià Talaya López and directed by Ismael Colomina Folch at the Technical University of Catalonia.
- *Analytic capacity and Riesz kernels,* defended on June 26th, 2003 by Laura Prat and directed by Joan Mateu and Joan Verdera at the Autonomous University of Barcelona.
- *Mathematical modelization and simulation of metal recuperation processes from residual waters using hollow fiber supported liquid membranes,* defended on June 25th, 2003 by Graciela Benzal and directed by Amadeu Delshams and Anna Sastre at the Technical University of Catalonia.
- *Localizations and completions of aspherical spaces,* defended on June 13th, 2003 by

Gemma Bastardas i Ferrer and directed by Carles Casacuberta at the Autonomous University of Barcelona.

- *Set of periods, topological entropy and combinatorial dynamics for tree and graph maps,* defended on June 13th, 2003 by David Juher i Barrot and directed by Lluís Alsedà and Pere Mumbrú at the Universitat Autònoma de Barcelona.
- *Improving evaluation codes,* defended on June 5th, 2003 by Maria Bras Amorós and directed by Sebastià Xambó Descamps and Michael O'Sullivan at the Technical University of Catalonia.
- *Intervals of marks,* defended on May, 2003 by Lambert Jorba Jorba and directed by Ernest Gardeñes Martín at the University of Barcelona.
- *Analysis and construction of topological structures useful for the modelization of interconnection networks,* defended on April 24th, 2003 by Eduardo A. Canale Betancourt and directed by José Gómez Martí and Xavier Muñoz López at the Technical University of Catalonia.
- *On the dynamics of the Trojan asteroids,* defended on April 29th, 2003 by Frederic Gabern Guilera and directed by Àngel Jorba Monte at the University of Barcelona.
- *Galois groups over $\mathbb{Q}$ with prefixed ramification conditions,* defended on April 30th, 2003 by Bernat Plans i Berenguer and directed by Núria Vila at the University of Barcelona.
- *Decompositions of graphs into trees,* defended on February 20th, 2003 by Susana Clara López Masip and directed by Anna Lladó at the Universitat Politècnica de Catalunya.
- *Abelian varieties with quaternionic multiplication and their moduli,* defended on January 30th, 2003 by Víctor Rotger Cerdà and directed by Pilar Bayer Isant at the University of Barcelona.
- *Numerical study of Hopf bifurcations in the two-dimensional plane Poiseuille flow,* defended on November 28th, 2002 by José Pablo Sánchez Casas and directed by Àngel Jorba at the Technical University of Catalonia.
- *On the quasi-periodic Hamiltonian Andronov -Hopf bifurcation,* defended on October 21th, 2002 by Juan Ramón Pacha Andújar and directed by Merce Ollé and Jordi Villanueva at the Technical University of Catalonia.
- *Geometric problems on inscription and partition of figures,* defended on July 10th, 2002 by Roser Guàrdia Riera and directed by Ferran Hurtado Díaz at the Technical University of Catalonia.
- *The origins of the nuclear engineering in Barcelona, the* Càtedrra Ferran Tallada *(1955-1962)* defended on July 2nd, 2002 by Francesc Xavier Barca and directed by Guillermo Lusa at the Technical University of Catalonia.
- *Cohomology and deformation theory for semigroupal 2-categories,* defended on June 21th, 2002 by Josep Elgueta Monto and directed by Sebastià Xambó i Descamps at the Technical University of Catalonia.
- *On geometric separability,* defended on June 3st, 2002 by Carlos Seara Ojea and directed by Ferran Hurtado Díaz at the Technical University of Catalonia.
- *Local cohomology modules supported on monomial ideals*, defended on May 24th, 2002 by Josep Álvarez Montaner and directed by Santiago Zarzuela at the University of Barcelona.