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Title

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Abstract

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And also: To all my professors, for the education they give me. Specially:

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‘A mathematician, like a painter or a poet, is a maker
of patterns. If his patterns are more permanent than theirs, it is because they are made
with ideas.’

G. H. Hardy

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Bibliografía

- [AG90] E.L. Allgower and K. Georg. *Numerical Continuation Methods*. Springer. 1990.
- [And66] Vitt A. Khaikin S. Andornov, A. *Theory of Oscillators (versión inglesa*. Pergamon Press. 1966.
- [Bur05] A.T. Burton. *Volterra Integral and Differential Equations*. Elviesier, 2005.
- [CL72] E. A. Coddington and N. Levinson. *Theory of ordinary differential equations*. McGraw-Hill, 1972.
- [DO12] Eusebius J. Doedel and Bart E. Oldeman. *Auto-07p: Continuation and bifurcation software for ordinary differential equations*. 2012.
- [Doe] E. Doedel. *Lecture Notes on Numerical Analysis of Nonlinear Equations*.
- [EK05] L. Edelstein-Keshet. *Mathematical models in biology*. SIAM, 2005.
- [Fit61] R. Fithugh. *Impulses and physiological states in theoretical model os nerve membranes*. Biophysics Journal. 1961.
- [GA96] Berridge M.J. Goldbeter A. *Biochemical Oscillations and Cellular Rhythms*. Cambridge Nonlinear Science Series. 1996.
- [Geo80] K. Georg. *Numerical integration of the Davidenko equation*. In Numerical Solution of Nonlinear Equations. Lecture Notes in Math. 1980.
- [Hal07] T. C. Hales. *The Jordan curve theorem, formally and informally*. The American Mathematical Monthly, 2007.
- [Kel77] H.K. Keller. *Numerical Solutions of Bifurcation and nonlinear eigenvalue problem; in Applications of Bifurcation Theory*. Academic Press. 1977.

- [Kel86] H.B. Keller. *Lectures on Numerical Methods in Bifurcation Problems*. Springer-Verlag, 1986.
- [Kel95] C.T. Kelley. *Iterative Methods for Linear and Nonlinear Equations*. Society for Industrial and Applied Mathematics, 1995.
- [Kuz98] Y. A. Kuznetsov. *Elements of Applied Bifurcation Theory*. Springer, 2 edition, 1998.
- [Lud78] Jones D.D. and Holling C.S. Ludwig, D. Quantitative analysis of insect outbreak systems: The spruce budworm and forest. 1978.
- [MM76] J. E. Marsden and M. McCracken. *The Hopf Bifurcation and Its Applications*. Springer-Verlag, 1976.
- [Mun11] R. Muñoz. *Introduction to Bifurcations and the Hopf bifurcation theorem for planar systems*. Student Journal of Dynamical Systems, Colorado University, 2011.
- [Mur03] J. Murdock. *Normal Forms and Unfoldings for Local Dynamical Systems*. Springer, 2003.
- [Nag62] Arimoto S. Yoshizawa S. Nagumo, J. *An active pulse transmission line simulating nerve axon*. Procedures IRE, 1962.
- [Per01] L. Perko. *Differential Equations and Dynamical Systems*. Springer-Verlag, 2001.
- [Pyt] Python Software Foundation. *Python Language Reference, version 2.7*.
- [Sel86] E. E. Sel'kov. Self-oscillations in glycolysis. 1986.
- [Sey10] R. Seydel. *Practical Bifurcation and Stability Analysis*. Springer, 3 edition, 2010.
- [SG99] A. Spence and I.G. Graham. *The graduate student's guide to Numerical Analysis '98*. Springer, 1999.
- [Sim75] R.B Simpson. *A method for the numerical determination of bifurcation states of nonlinear systems of equations*. SIAM Journal Numerical Analysis, 12. 1975.
- [Str94] S. H. Strogatz. *Nonlinear Dynamics and chaos*. Perseus Books, 1994.
- [VdP27] B. Van der Pol. *On relaxation-oscillations*. The London, Edinburgh and Dublin Journal of Science. 1927.