

THE HIRSCH CONJECTURE III

The Unilateral Shift IDE and $2x \bmod(1)$

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Abstract. This paper provides a proof that the pointwise difference between the unilateral shift IDE and $2x \bmod(1)$ can be made arbitrarily small as the step size parameter, h , goes to zero.

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1 Introduction

"A major challenge to mathematicians is to determine which dynamical systems are chaotic and which are not. Ideally one should be able to tell from the form of the differential equation"
– Morris W. Hirsch, 1985 [1], page 192.

The Hirsch Conjecture raises two questions: (1) What difference does it make if the conjecture is true; (2) what would be the significance of proving that the conjecture is true?

1.1 Why does The Hirsch Conjecture matter to science, mathematics, medicine and engineering?

The Hirsch Conjecture, if true, could make a significant difference to every field of science because it greatly simplifies the process of determining whether or not a system is chaotic.

The reason that it is important for chaotic systems to be efficiently identified is that chaotic systems are unstable and unpredictable and those two properties are significant when trying to predict the weather or the dynamics of a design of an airplane wing or the course of a disease.

To better understand why the Hirsch Conjecture simplifies the determination of chaos in a system requires understanding how chaos is formally proven today. Proof