Solving Nonlinear Equations of One Variable

by

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of the requirements for the degree of
Doctor of Philosophy
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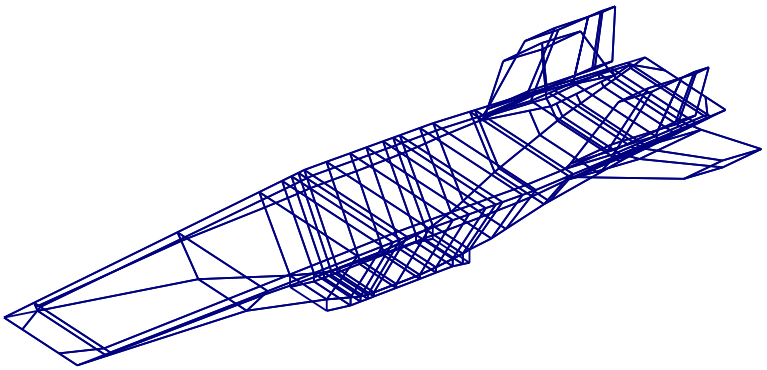
Doctoral Committee:

Professor James F. Driscoll, Chair
Professor Peter J. Olver, University of Minnesota



2012

This dissertation is in honor of Adlai Stevenson and William Jennings Bryan, who were both twice the Democratic nominee for President of the United States without winning either time. As an interesting side note, Adlai Stevenson's grandfather, Adlai E. Stevenson I, was William Jennings Bryan's running mate in the 1900 election.

A C K N O W L E D G M E N T S

It is imperative that I thank all of the authors of the dissertation template from the Department of Atmospheric, Oceanic and Space Sciences, which is available online at http://aoss.engin.umich.edu/. To my knowledge, the authors include Jin Ji, Roque D. Oliveira, and Jason Gilbert. I also must thank Sara Spangelo for suggesting that this template be ready by the end of April 2011.

Preface

The text of this document is of course mainly meant to show how the template works. The topic is thus a basic problem which has been solved in a large number of ways. This sample topic, which is solving equations of one variable using iterative techniques, allows us to use sample equations and figures so that we can see how they will look in this template. In addition to the standard methods, the text also demonstrates a new algorithm that has slightly improved performance.

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CFD Computational Fluid Dynamics

ABSTRACT

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Chair: James F. Driscoll

We show that it is possible to get approximate solutions to analytically intractable equations using iterative methods. Thus we show that the author could pass an undergraduate class in numerical analysis. In addition, a unique extension to Brent's method is proposed that results in slight improvements in convergence.

Chapter 1

Introduction

The first part. For example in Computational Fluid Dynamics (CFD).

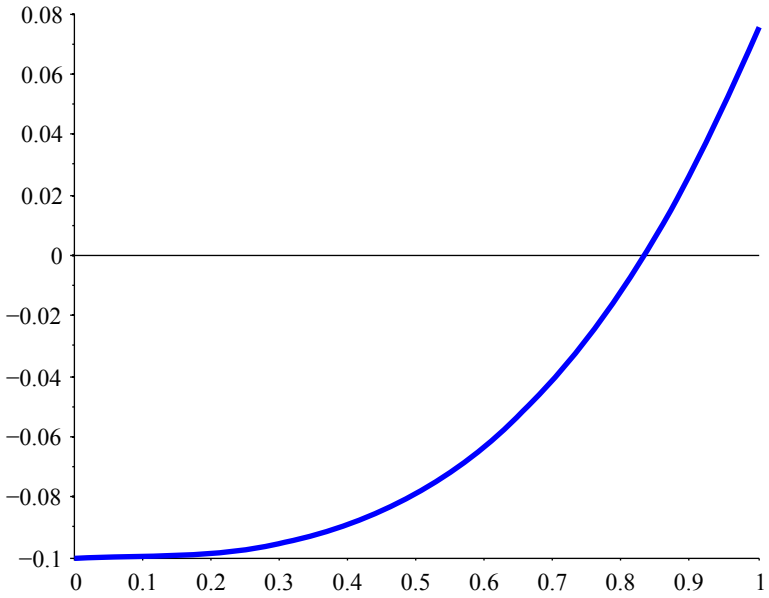

Figure 1.1: An example of a search function

And this should at least continue onto a second page. There are many texts that have a section on the subject, for instance [1].

Chapter 2

Setting

The second chapter has the good stuff.

2.1 Convergence Criteria

Actually, it might have the worst stuff. But it is slightly easier to write than the material in Chapter 1.

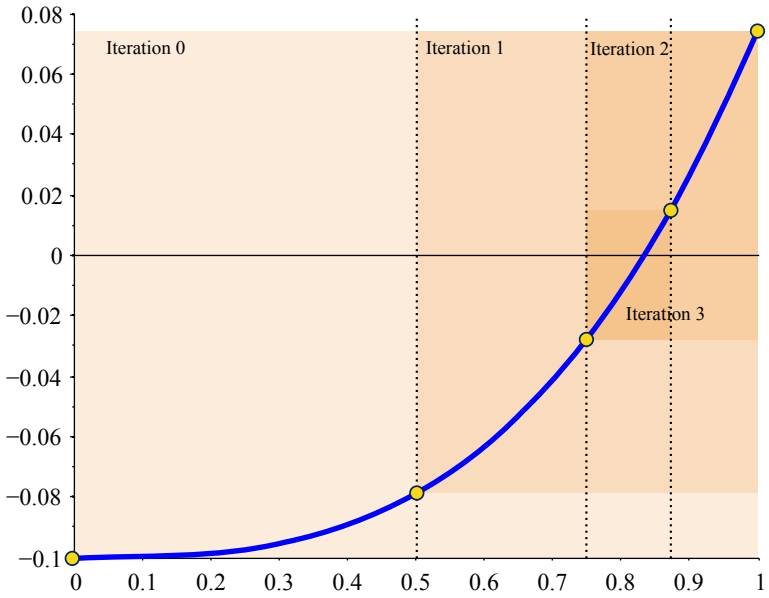

Figure 2.1: Illustration of x- and y-tolerances for bisection iterations

It takes very little text to fill a page in this format, but there is even less text on most of these sample pages.

2.2 Why we are doing it

It is usually a good idea to give reasons for your research. If you do not, the people who payed you to waist all that time will feel really bad about it, and then they will not provide the same opportunity to future students.

I need this page to see what even-numbered pages look like.

Appendix A

Methods

Here is how to implement the methods.

A.1 Bisection

The easiest method.

$$x_k = \frac{a_k + b_k}{2} \tag{A.1}$$

A.2 False Position

The next one.

```
(A map of the United States)
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Program A.1: Map of the United States

BIBLIOGRAPHY

[1] Chapra, S. C. and Canale, R. P., *Numerical Methods for Engineers*, McGraw-Hill, 4th ed., 2002.