

# **Chebfun Guide**

1st Edition

For Chebfun version 5

Edited by:  
Tobin A. Driscoll,  
Nicholas Hale,  
and Lloyd N. Trefethen

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Dedicated to the Chebfun developers of the past, present, and future.



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## ***Preface***

This guide is an introduction to the use of Chebfun, an open source software package that aims to provide “numerical computing with functions.” Chebfun extends MATLAB’s inherent facilities with vectors and matrices to functions and operators. For those already familiar with MATLAB, much of what Chebfun does will hopefully feel natural and intuitive. Conversely, for those new to MATLAB, much of what you learn about Chebfun can be applied within native MATLAB too.

Some of the chapters give clues about how Chebfun does its work, but that is not an emphasis of this guide. For the mathematical underpinnings of Chebfun, the best source is *Approximation Theory and Approximation Practice*, by Lloyd N. Trefethen (Society for Industrial and Applied Mathematics, 2013). For the algorithmic backstory, refer to the list of publications maintained at [www.chebfun.org](http://www.chebfun.org).

We gratefully acknowledge the Engineering and Physical Sciences Research Council of the UK, The MathWorks, Inc., and the European Research Council, whose generous support has helped the project grow and thrive. We also acknowledge the support of the University of Oxford and the University of Delaware.

Most especially we acknowledge and praise the many contributors to Chebfun. As of version 5, the code consists of over 100,000 lines produced over the course of the past twelve years. In addition to writing code, many individuals have contributed their time to the design, testing, review, and debugging of code written by others. For their development efforts, we thank Anthony Austin, Zachary Battles, Ásgeir Birkisson, Pedro Gonnet, Stefan Güttel, Hrothgar, Mohsin Javed, Georges Klein, Hadrien Montanelli, Ricardo Pachón, Rodrigo Platte, Mark Richardson, Alex Townsend, Grady Wright, and Kuan Xu. Others who have made key contributions include Jean-Paul Berrut, Folkmar Bornemann, Yuji Nakatsukasa, Vanni Noferini, Sheehan Olver, Joris Van Deun, and Marcus Webb.

*Toby Driscoll, Nick Hale, and Nick Trefethen*  
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Part I

Functions of one variable

