Preface

Let me begin with a short history of the book. In 2000 I gave seminar lectures at the University of Saskatchewan and, later, also at Università di Pisa. The notes from these lectures were written up and appeared under the title "Positive polynomials and sums of squares" in the series Dottorato de Ricerca in Matematica, published by Università di Pisa, in 2000 [M1]. In 2004, I gave a graduate course at the University of Saskatchewan on the same topic. At that time, I expanded on the material considerably, including additional explanation, additional material on the moment problem, and material on the newly discovered application to optimization. These revised notes were used later, by Salma Kuhlmann, as a basis for her course at the special trimester in real algebraic and analytic geometry at Institut Henri Poincaré in Paris in 2005. In the spring of 2006 I started working on this again, the goal being to include additional recent developments and also to simplify arguments wherever possible. The reader who is familiar with [M1] will see various parts of [M1] surviving in what is presented here. At the same time, it is important to understand that a lot of new material has been added. The length has increased by a factor of three. Chapters 3, 4, 9 and 10 are completely new and, in the remaining chapters, new sections have been added, and the presentation has been modified in significant ways. Two appendices have also been added.

I want to thank everyone who contributed to the book in one way or another. A complete list, of course, would include everyone mentioned in the bibliography, and all the people who discussed various aspects of the subject with me, over the years. Special thanks are due to those who attended my course and seminar presentations on the subject, and provided feedback, and to Doris Augustin, Igor Klep and Tim Netzer for their valuable commentary in the latter stages of the project.

I should say finally that, in writing such a book, there are bound to be errors and mistakes of various sorts, and situations where the approach taken is wrong, or misleading, or, at the very least, not the best one. Of course, it would be nice to avoid all these things, but this is not going to happen – for a variety of reasons, but partly because the subject itself is still evolving – so I can only apologize to the reader in advance for all errors and mistakes and false impressions that I may convey, and hope there are not too many of them. A list of errata and corrections can be found on the webpage for this book. The URL is printed on the backcover of the book.