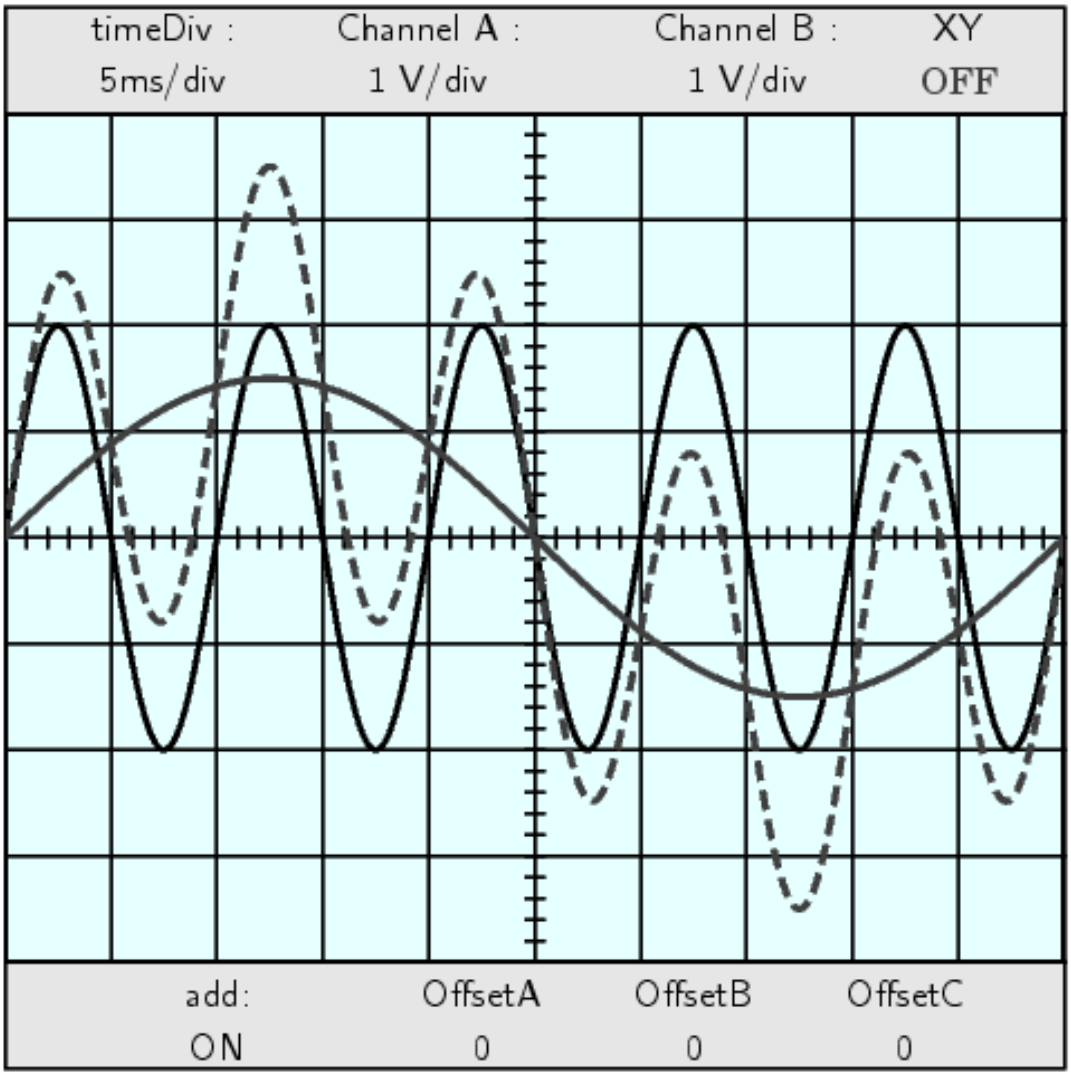
TRIGONOMETRY

MICHAEL CORRAL



Trigonometry

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About the author:
Michael Corral is an Adjunct Faculty member of the Department of Mathematics at Schoolcraft College. He received a B.A. in Mathematics from the University of California at Berkeley, and received an M.A. in Mathematics and an M.S. in Industrial & Operations Engineering from the University of Michigan.

This text was typeset in LaTeX with the KOMA-Script bundle, using the GNU Emacs text editor on a Fedora Linux system. The graphics were created using TikZ and Gnuplot.

Preface

This book covers elementary trigonometry. It is suitable for a one-semester course at the college level, though it could also be used in high schools. The prerequisites are high school algebra and geometry.

This book basically consists of my lecture notes from teaching trigonometry at Schoolcraft College over several years, expanded with some exercises. There are exercises at the end of each section. I have tried to include some more challenging problems, with hints when I felt those were needed. An average student should be able to do most of the exercises. Answers and hints to many of the odd-numbered and some of the even-numbered exercises are provided in Appendix A.

This text probably has a more geometric feel to it than most current trigonometry texts. That was, in fact, one of the reasons I wanted to write this book. I think that approaching the subject with too much of an analytic emphasis is a bit confusing to students. It makes much of the material appear unmotivated. This book starts with the "old-fashioned" right triangle approach to the trigonometric functions, which is more intuitive for students to grasp.

In my experience, presenting the definitions of the trigonometric functions and then immediately jumping into proving identities is too much of a detour from geometry to analysis for most students. So this book presents material in a very different order than most books today. For example, after starting with the right triangle definitions and some applications, general (oblique) triangles are presented. That seems like a more natural progression of topics, instead of leaving general triangles until the end as is usually the case.

The goal of this book is a bit different, too. Instead of taking the (doomed) approach that students have to be shown that trigonometry is "relevant to their everyday lives" (which inevitably comes off as artificial), this book has a different mindset: *preparing students to use trigonometry as it is used in other courses*. Virtually no students will ever in their "everyday life" figure out the height of a tree with a protractor or determine the angular speed of a Ferris wheel. Students are far more likely to need trigonometry in other courses (e.g. engineering, physics). I think that math instructors have a duty to prepare students for that.

In Chapter 5 students are asked to use the free open-source software Gnuplot to graph some functions. However, any program can be used for those exercises, as long as it produces accurate graphs. Appendix B contains a brief tutorial on Gnuplot.

There are a few exercises that require the student to write his or her own computer program to solve some numerical computation problems. There are a few code samples in Chapter 6, written in the Java and Python programming languages, hopefully sufficiently clear so that the reader can figure out what is being done even without knowing those languages.