

PREFACE

*intended audience
for this text*

This text is intended to be used for a one-semester (16 week) course introducing calculus to non-mathematics and non-engineering majors. The course should meet approximately four hours per week. Alternatively, the text can be used for a more leisurely-paced two-semester course, meeting about three hours per week. At Idaho State University, the text has been used for a course that meets a general education requirement in mathematics.

*neglect of
the language
in which mathematics
is expressed*

The *language* in which mathematical ideas are expressed is usually underemphasized in the standard curriculum. Emphasis is placed on *what* is said, not *how* it is said. Without an understanding of the language of mathematics, students can't read their mathematics books, and can't express mathematical ideas in a coherent way.

*writing across
the curriculum*

Educators have stressed the importance of *writing across the curriculum*; this text directly focuses attention on writing skills. As the need arises, students are exposed to elements of the mathematics language, and are given ample exercises to practice the language while learning the mathematics concepts. Chapter 1 provides the foundational language issues on which the rest of the text builds, and hence has a flavor that is very nontraditional.

*two-column
format used in
this text*

This text is designed to be easy to use for the instructor. The two-column page format identifies the key concept discussed in almost every paragraph. Definitions, notation, theorems, examples, and exercises appear **bold-faced** in the left-hand column. Key ideas in expository paragraphs appear in *italics* in this thin column. Thus, the instructor can skim the sections and easily identify the topics presented.

*how to use
the two-column format*

Some people using this text will choose to ignore the left-hand 'key idea' column on a first reading, using the column merely as a feature that enables easy location of results. Others will choose to read the 'key idea' phrase *before* reading the companion paragraph, as a way to help maintain focus on the central idea. (Too often, students lose the forest because of all the trees!) In addition, the two-column format provides lots of room for writing in the margins.

*review material
is interspersed
throughout the text*

Many students learn better when there is an *immediate* use for the material. For this reason, necessary review material is included in the sections where it is needed. Occasionally, review material is purposefully repeated; this saves the student 'look-up' time, and provides an opportunity for the author to give a slightly different viewpoint to already-introduced ideas.

two types
of exercises:

in-section exercises,
to encourage
active reading

There are two types of exercises in this text.

In order to learn to read mathematics, students *must read mathematics*. Unfortunately, too many students rely on lectures alone as a source of information, and use the book solely for the exercises (and answers to exercises).

To counter this problem, the text has an abundance of ‘in-section’ exercises—exercises intertwined with the exposition. These exercises directly address concepts discussed in the paragraphs immediately preceding them; thus, in order to do the exercises, the student *must read the book*. For example, a student might be asked to re-write a paragraph so that it is correct for a slight modification of an idea.

The in-section exercises are designed not only to encourage *reading*, but also to encourage *active reading*—the correct way to read mathematics is with *pencil in hand*!

It is intended by the author that every one of the in-section exercises be attempted by every student.

optional
Student’s Solution
Manual

Complete answers to the in-section exercises are available in the supplemental Complete Solution Manual.

more traditional
end-of-section
exercise sets

Secondly, there are traditional end-of-section exercise sets. These exercises provide reinforcement of both the calculus and language concepts discussed in the section.

Abbreviated answers to odd-numbered end-of-section problems are given at the end of the text. The supplemental Complete Solution Manual contains answers to *all* the exercises. These solutions are carefully written in *complete mathematical sentences*, to reinforce the correct writing of mathematics that is emphasized throughout the text.

♣ *symbol*

The clubsuit symbol ♣ identifies the specific part(s) of a question that must be answered by the student.

Many of the exercises contain a moderate amount of exposition. The question(s) that the student must answer are often imbedded in this exposition, and the ♣ makes them easier to spot.

★ *symbol*

More advanced material in the text is labeled with the star symbol ★. This material may not be appropriate for a first reading. However, this ★ device allows the author to say more of the complete truth without interrupting the exposition.

★★ *symbol*

Material that is labeled with ★★ is probably appropriate for the instructor’s eyes only.

the ‘quick quiz’

The author firmly believes that the only way to really learn mathematics is *a little bit at a time*. Two hours each day is far superior to a Saturday marathon. To gently encourage this every-day commitment to the subject, the author has found the following ‘quick quiz’ technique extremely successful.

At the beginning or end of each class, a very short (1–2 minute) quiz is given, over material covered in the previous lecture. The question is extremely basic. The quiz is worth 1 point; to get this point, the student must answer the question correctly, *using complete and correct mathematical sentences*. For example, a student who is asked to differentiate $f(x) = x^2$ and writes $f(x) = x^2 = 2x$ has not written a correct mathematical sentence, and will not get the point. The mistake is quickly corrected!

Any points that are accumulated on these quizzes get added on to the student’s next test grade; thus, they cannot hurt the student, but can certainly help. This positive reinforcement technique has been *extremely* successful in getting students to attend class, and read over their notes before the next lecture.

Some sample ‘quick quiz’ questions are included at the end of each section. Solutions to the ‘quick quiz’ questions are given at the end of the text.

‘Keywords’

Each section is concluded with a list of ‘keywords’. Students studying for an exam should look through each ‘keyword’ list to ensure that they have not missed any important information.

\TeX

This text was typeset using \TeX (pronounced so that it rhymes with *blecchhh*). \TeX is a typesetting system that is ideally suited to books containing lots of mathematics. From the \TeX output, pdf files were created to be put on the World Wide Web.