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Preface

Mathematics is the language of science and engineering. Like all languages, it has its own special vocabulary. When confronted with an unfamiliar *word* from its lexicon, we can search for that term in our textbooks or on the web using tools such as Google or Mathworld [**13**]. But what do we do when confounded by some strange arrow or squiggle? Just how would one type $\mapsto$ or $\ni$ into a search engine?

The goal of this *Guide* is to provide a solution to this conundrum. We have collected a wide assortment of mathematical symbols and notation commonly[1] used in science and engineering for your easy reference.

How to use this *Guide*

Our aim is twofold. First, we provide a tool for readers to look up notation they may have confronted in a class or a textbook. Here's how you'll locate it in this *Guide*.

- If the unknown notation you seek is based on a Latin letter such as $\forall$ or $\mathcal{L}$, or a word such as det, then search the Alphabetical Notation Index (on page 73) under the appropriate letter (A, L, and D in these examples).
- If the unknown notation is based on a Greek letter, then search the Greek Notation Index (page 77). The Greek alphabet is shown in Figure 1.1 on page 2.
- If the notation is some other sort of symbol (a decoration on a letter, an operation symbol, an arrow, and so on), then consult the Chart (page 69). The Chart also provides LaTeX code[2] for typesetting the notation.
- If you know the general area of mathematics from which the notation arises, then you can proceed directly to the relevant chapter for that discipline. Alternatively, you can consult the Topic Index (page 79).

[1] We do not claim to cover all notation used by mathematicians; see [**11**] to understand why that task would be overwhelming. We focus on notation one is likely to see in university-level courses.

[2] This is useful only for readers with some familiarity with LaTeX. We strongly encourage the use of LaTeX for technical writing. For good introductions see [**2**], [**5**], or [**6**]. For advanced information, refer to [**3**].

Second, we provide guidance on how to use notation. For example, what symbol should you use for a vector of all 1s? (Answer on page 39.) When there is more than one choice (e.g., $f'(x)$, dy/dx, or $\dot{y}$ for derivative) we show the various forms, and sometimes express a preference for one notation versus another.

How *not* to use this *Guide*

Do not expect to learn new mathematics from this book; that's not our goal. Rather, enough information is provided to *remind* you about notation/ideas you may have previously encountered or to search for an appropriate reference for full detail.

On occasion we use notation in one chapter before it is presented in a later chapter. This is consistent with our philosophy that we are trying either to assist readers with notation for concepts they already know or to provide sufficient context so they can consult an appropriate reference.

This *Guide* does not address discipline specific notation. For example, chemists use square brackets to denote concentration $[Na^+]$, but this is a convention from chemistry, not mathematics, and so it is beyond the scope of this *Guide*. We also do not cover notation for physical constants such as $\hbar$ (Planck's constant divided by 2π).

We hope you enjoy your journey through the jungle of mathematical notation and that you quickly find where $\otimes$ marks the spot.

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Special thanks to Jonah Scheinerman for extensive stylistic and editorial help as well as for the art and design of the cover of this book.

I welcome your feedback and comments. Please visit the web page for this book

`http://www.ams.jhu.edu/~ers/notation`

for updates and errata.

—Ed Scheinerman, Baltimore