

Good Mathematical Writing Style: Summary of Rules

by
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Introduction

We present the rules as annotations and references in an index of phrases, terms, and topics related to mathematical writing. Where possible, each index entry contains a summary of rules pertaining to the item indexed, followed by a list of relevant page references in one or more of four leading books on style. Otherwise we simply give relevant page references. We use the following abbreviations for the books referenced in this paper:

“F” for *Fowler’s Modern English Usage*, any recent edition

“H” for “Higham, Nicholas J., *Handbook of Writing for the Mathematical Sciences*, SIAM, Philadelphia, 1998”;

“Ha” for “Halmos, Paul, et al., *How to write mathematics*, American Mathematical Society, 1973”;

“K” for “Knuth et al., *Mathematical Writing*, Mathematical Association of American, 1989”;

“Kr” for “Krantz, Steven G., *A Primer of Mathematical Writing*, American Mathematical Society, Providence, R.I., 1997”.

Thus, for example, “Kr72” means “page 72 in Krantz...”.

The experts don’t always agree, so in this index I have chosen the rule that I have seen most often applied in the literature.

This is a work in progress. We will welcome comments and suggestions from readers. Write to Peter Schorer at peteschorer@cs.com

— A —

abstract — should summarize contents of paper, should be less than 300 words; no equations;

no references by number Kr72, H85, 111

active vs. passive voice — use active, H110

“all” — “each” is preferred wherever possible, K92, Kr35-36

“assume” — write “assume that”, K2

“any” — avoid in definitions, statements of lemmas and theorems, and in proofs when “all” or

“each” or “every” is intended, Kr35, Ha38

“assume” — follow it with “that”, K2

“author” — use “we” instead of “the author”

authors, discriminating between in a paper, K10

— B —

“begin...end” in computer programs, K25

bibliographic references, K92, Kr73

boldface, K12

“both”, H49

box to mark end of proof — yes, use \square K12

brackets, K11

breaking a line in a displayed equation — see under “equation, displayed”

— C —

capital letters — write, e.g., “Theorem 1”, “Lemma 3” K3, K12
“cf” — means “compare”, not “see” Kr37
change (see also “replace”), K16
“claim”, Kr67
colon: K11, H41
color, K40
commas, K5, K11, K92, K96
“compare”, Kr48, H44
“component” vs. “element”, K9
“Consider...” , K60
continuing a line in a displayed equation — see under “equation, displayed”
contractions — don’t use them: say “cannot”, not “can’t”, etc. Kr37, H42
contradiction, proof by — see under “proof by contradiction”
“contrast”, Kr48
“corollary”, H16
curly braces, K11

— D —

dashes, K16
definitions — discussion of K91, Kr69, H19-20; definition should be located near where it is first used; in definitions, don’t use “iff”, use “if” instead H20; italicize word being defined; after defining a set, you must prove, not that “it exists”, but that it is non-empty¹; standard symbols used for “is defined as”: H21
“denote”, Kr39
“different from” — is preferred over “different than”, Kr48
“different than” — use “different from” instead, Kr48
diagrams (see also “illustrations”), K37
displayed equation
drawings, K40
“due to the fact that” — say “because” instead, Kr48

— E —

“each” — preferred to “all”, K92, Kr35
“easy to see”, Ha33
“e.g.” — spell it out: “for example” Kr37
“either...or”, H58
equations, referring to, H31
“element of” — reserve “ \in ” for set membership only, use “ ϵ ” for, e.g., an arbitrarily small quantity Ha26, K9, K10

1. Communication from professional mathematician

ellipses, i.e., "...", K9

equation, displayed — number only if equation is referred to later;

break long lines *before* the relation sign, e.g., before "=", before arithmetic operator sign, e.g., "+", etc., K16, Ha42, H28; equation must have concluding correct punctuation (period, semicolon, comma)

equation in text — at end of text line, break *before* the relation sign, e.g., before "=", before arithmetic operator sign, e.g., "+", etc., H28

exclamation points — use sparingly, K6, H52

expression in text — at end of text line, break *after* the arithmetic operator sign, e.g., "+", etc., H28

— F —

"farther" — denotes distance: "He drove farther that day than he did the previous", Kr49; see also "further"

"fewer" — see "'less' vs. 'fewer'"

first, second, etc. — see "ordinal numbering"

footnotes — use sparingly H103

"for all" — "for each" is preferred; "∀", should not be used (except where appropriate in papers on logic), K1, H26, 27

formal logic, Ha38

formulas, K2, K3, K9

formulas, displayed, K10, K16

functions, for which function names to italicize, which to leave in roman, see H32

"further" — suggests time or quantity: "I wish to study further the question...", K49?, Kr49; see also "farther"

— G —

"given" — try to avoid using, Kr29, Ha37

— H —

"he or she" — preferred to "he" alone or "she" alone or "they" or "s/he" (Fowler's *Modern English Usage*). Personal pronouns are not normally used in math papers or books, but they definitely are in communications with editors ("The third item in the referee's report seems to indicate that he or she did not understand Lemma ...")

"hopefully" — don't use at beginning of sentence; instead say "It is hoped that...", Kr49

"however" — OK to begin a sentence with it, but must be followed immediately by a comma, F under "however"

hyphens, K16, K92, H47

— I —

"I" — use "we" instead, K10

"i.e." — spell it out: "that is" Kr37

“if” — should always go with a “then”, Ha44
“iff”, H37
illustrations (see also “diagrams”), K40
“implies” — say, e.g., “...which implies q ” not “which implies that ” Ha 37
inequality, Ha42
“in order to”— just say “to”H112
“instead”, K17
integrals, K17
“in terms of” — omit, Kr51
introduction, H87-89
“It is” (clear, interesting, etc.) H53

— J —

journal references in bibliography, K9

— L —

lemmas, K3
“less” vs. “fewer” — “Less refers to quantity, amount, size, ‘fewer’ to number: Thus ‘the zeros of $f(x)$ are less than those of $g(x)$ ’ means that if x is a zero of f and y is a zero of g , then $x < y$; ‘the zeros of $f(x)$ are fewer than those of $g(x)$ ’ means that g has more zeros than f ”; H44; see also K4.
“let”, K7, H51
line in a displayed equation, continuing a — see under “equation, displayed”
lists separated with commas — put a comma after every item except the last: e.g., write “the good, the bad, and the ugly”, not “the good, the bad and the ugly”. Kr40
logical order, Kr62
logical symbols — don’t use: write word equivalents instead: “for each”, “there exists”, etc. K1

— M —

multiplication, K9

— N —

“need only show” — preferable to “only need to show”, Kr52
“nonnegative” — no hyphen, K4
“nonzero” — no hyphen, K4
notation, Kr69-72, Ha40
 n th, see “ordinal numbering”
number — say, e.g., “A countable infinity of the elements of set X map to 1,” but “The number of elements in set Y is finite.” Plural verb in the first case, singular verb in the second. F, “number”; none of the other books listed in “Introduction” on page 2 seem to deal with the question of when to use plural, when to use singular verbs in this context.

numbering of definitions, lemmas, theorems, Kr19
numbering, ordinal, see “ordinal numbering”
numbers,
 spell out small ones, K3

— O —

“obvious”, Ha33
“only”, H57
ordinal numbering — write k th, $(k + 1)$ st, $(k + 2)$ nd, $(k + 3)$ rd, $(k + 4)$ th, ..., i.e., suffix is same as it would be for i alone in $(k + i)$; write n th; write zeroth, first, second, third, fourth, H63
organization of a paper — first para. or two should summarize main results of paper in as non-technical language as possible, next paragraphs should give history of problem, earlier results, and exactly what progress the paper represents, next comes acknowledgements, then outline of organization of paper, then big steps of proof, with nasty details of proofs of lemmas at end of paper, then theorem and proof ; this organization is easier for reader than one in which all is in strictly logical order, Kr60-64

— P —

paper, organization of, Kr60-64
paragraph length, H50
parallel structure (giving phrases of similar content and purpose, similar form) — can be effective, Kr52
parallelism, K2
parentheses, nested — avoid them K11
periods, K5
plurals of numbers, symbols — say, e.g., “a random matrix of 0s and 1s”, “these f s are all continuous” H52-53
plural vs. singular — see “singular vs. plural”
problem, H49
proof — always state what is to be proved first, then give proof Ha34, Ha43; use \square to mark end of proof; leave space between it and final period K12
proof by contradiction — to prove X, begin by saying “Assume the contrary.”, or “Assume by way of contradiction that...”; after getting a contradiction, conclude “This contradiction completes the proof.” (email from professional mathematician); see also K8, K13
proofs, K7-8, K40, Kr67, H17
proofs, examples of, K7, K43-44
proofs, by contradiction, K8, K13, Kr68-69

— Q —

quotation marks — put quotation marks *after* the period, K5, Kr49, Kr 53-54

— R —

read aloud, K13
readers, concern about, K91
“reference” — never use as a verb K107
references, K17, K92, H113 (don’t start a sentence with, e.g., “[12]”)
relations: words vs. symbols — if words on one or both sides, spell out relation, e.g., “If the result is greater than X_c , then...”, not “If the result $> X_c$, then...”; otherwise OK to use symbol: “If the result $R > X_c$, then...”. K45, H26
repetition of words, K16, K17
“replace” (see also “change”), K16
relation, K9, K13

— S —

sample data, K38
“satisfy”, H62
sentence length — shorter is better than longer
sentences, K13
sentence, starting a, H
“shall”, K13
“s/he” — see “he or she”
singular vs. plural — Don’t write “Domains with noncompact automorphism groups have orbit accumulation points in their boundaries”; instead write “A domain with noncompact automorphism group has an orbit accumulation point in its boundary”. Kr29-30
split infinitive — not allowed, K75, Kr.50; definitely allowed in certain circumstances, F
style, writing — have your audience clearly in mind, write for it, K59-60
subheading, K91
subscripts, don’t use them if not necessary; *no subscripted subscripts!*, K3, K9, K40, K42
“suffices” — “it suffices to show” is preferable to “suffices it to show”, Kr52
subtitles, section headings — should not be referred to in the text. Say, e.g., [subtitle]“Is p a Prime Number”? [text]“We now attempt to determine if p is a prime number...” Don’t say, e.g., [subtitle]“Accuracy of the Computed Solution” [text] “It depends on the machine precision...”, say [text] “The accuracy of the computed solution depends on the machine precision...” H103
superscripts, K40, K42
“suppose”, follow it with “that”, K2
symbols [see also “variables”] — define them before you used them;
never start a sentence with a symbol K1, Ha40, 41;
symbols in different formulas must be separated by words, e.g., don’t say, $S_q, q < p$, say S_q , where $q < p$, K1,
don’t use logic symbols: say “for each”, “there exists”, “such that”, etc. instead K1, K9, K92
use symbols sparingly: you can say “ S is countable” instead of $S = \{s_1, s_2, \dots\}$ K43

— T —

talks, K40
tense, K13, K17, K92, H56
textbooks, good, K60
texts, K1
“that”, use “that” in constructions like “...the such-and-such that...”; use “which” in constructions like “...such-and-such, which is ...” K4, K94-95, Kr55; never say “We have that $x = y$ ”, instead say “We have $x = y$.” K4, K13, Kr55
“then” — should always go with an “if”, Ha44
theorems, K1, K3
theorem,
 statement of, Ha35, Kr64
 statement just preceding a theorem should be complete sentence or end with a colon, K1; say, e.g., “This result is proved in the following theorem: Theorem 3.13...” H102
 statement of theorem should be self-contained, K2
“there are” — don’t begin a sentence with it H53
“therefore”, K11
“there is” — don’t begin a sentence with it H53
“they” — see “he or she”
“this”, K67
title page of paper — should contain title that tells reader exactly what paper is about, name(s) of author(s), affiliations of authors, postal and email addresses, date, abstract, key words, AMS subject classification numbers, thanks to granting agencies and to others, Kr60
titles, Kr60, K9
titles of sections and sub-sections — should not be referred to explicitly or regarded as an integral part of the sub-section text K91
tone, K97
“try” — say “try to” not “try and” H50

— V —

variables [see also “symbols”] — don’t name something via a variable unless you are going to refer to it later on: e.g., don’t say, “if f is a continuous function ...” unless you are going to refer to f later on; Kr15-16, K2, K67; say, e.g., “We are seeking an integer n such that...” rather than “we are seeking an integer, n , such that ...” [this recommendation based on various mathematical texts]
“verify”, H62
vocabulary, K5

— W —

“we”
 use it instead of “the author” or “I”, H57, K2
 [see also “I”], K2, K10, Kr33
“we have”, H50
“where”, K1, Ha38
“which” — use “that” in constructions like “...the such-and-such that...”; use “which” in con-

structions like “...such-and-such, which is ...” K4, K94-95, Kr55
write as you speak, Ha22, Ha40
writing goals — make it as easy as possible for the reader to understand what you are saying;
so: begin with an outline; use short sentences, make your style as unobtrusive as possible
(Ha37); be redundant when necessary, keep reader informed as to where the argument is
going.