

PROOF WRITING

ABSTRACT. Some informal guidelines and additional readings to follow to help with proof-writing.

GUIDELINES FOR PROOFS

- (1) Use complete sentences.
- (2) Each sentence should set notation or be a true statement.
- (3) Each true statement should be a conclusion that can be drawn from the previous statements using a definition, computation, or result proved in class.
- (4) Do not assert the statement you wish to prove at the beginning of a proof. You should preface such statements with “We wish to prove” or similar.
- (5) Oftentimes, a good first step is just unwinding the definitions.
- (6) To prove “if p , then q ” directly, start your proof by assuming p is true. Then deduce that q must be true.
- (7) To prove “if p , then q ” by contraposition, start your proof by assuming q is false. Then deduce that p must be false.
- (8) To prove p by contradiction, start your proof by assuming p is false. Then deduce a contradiction.

Here are some examples of what is meant by (2) above.

- ax
This is not a sentence.
- $ax = b$ has a solution.
This is a sentence, but it is not true or false. We need to know more about a and b .
- Let $a \in \mathbb{R}$, $a \neq 0$. Then $ax = b$ has a solution.
This is a bit better. The first sentence sets notation, but the second sentence is still neither true nor false since we have not specified the universe for b .
- Let $a \in \mathbb{R}$, $a \neq 0$. Then $ax = b$ has a solution for every $b \in \mathbb{R}$.
The first sentence sets notation. All of the notation is defined. The second sentence is true.

SUPPLEMENTAL READINGS

Go to

<http://link.springer.com/book/10.1007%2F978-1-4419-7023-7>

while on campus and download *The Art of Proof* by Matthias Beck and Ross Geoghegan. Read carefully Chapters 1–7.