Common Mistakes in Proofs

MATH 2300   Winter 2010

A. Complete Sentences.

You have not written in complete sentences. This is very important in writing proofs. Mathematical proofs are more like logical essays than the algebraic proofs you have been used to. Please use complete sentences from now on.

B. Motivation missing.

You have provided no motivation for this step. While it is not always 100% necessary to explicitly state why you are doing something, the situation you were in required some explaination of why you would do something. For example, if the question is to show some vectors are linearly independent, and you start by writing out a matrix and doing Gauss-Jordan elimination, you have not made it clear why you are doing this.

C. Prove in the general case.

When attempting to prove an axiom of a vector space, you showed the axiom true for only very few specific vectors. You must show the axiom to be true for ANY vectors in the space by considering a general element (*e.g.*, $(a, b, c) \in \mathbb{R}^3$ rather than $(1, 2, 3) \in \mathbb{R}^3$).

D. Show your work!

You have not shown your work. The only time leaving out your work is acceptable is when the work is absolutely trivial. Row reducing a matrix is not trivial. Showing some element is a member of a vector space is usually not trivial. Always err on the side of showing the work.

E. Appeal to theorem.

You have failed to state explicitly that you are appealing to a theorem used in class or in the text, or you appealed to it at the wrong point. You must state when you are using it, and why it is alright to use it. For example, to use the subspace theorem to show that S is a subspace of V, it is necessary to point out that since V is a vector space, $S \subseteq V$, and S is closed under vector addition and scalar multiplication, the subspace theorem applies, and therefore S is a subspace of V.

F. "Obvious".

You have stated something is "obvious" or "clear", but it is neither. A number of people have even written that the most important step in the proof is "obvious" or "clear". The only time something should be called obvious is when it really is—that is, a six year old would say it's true...and if that's the case, does it really need to be said?

G. Messy work.

Your work is extremely messy. This not only makes it difficult for me to mark, it also makes it nearly impossible to read. Crossing out words extensively shows laziness. Write the work out once as messy as you like it, and then go over it and make a good copy. Would you hand in an English essay written the way you have written this?

H. Some step missed.

You have missed at least one crucial step to show what you are trying to show. For example, to show a set with some operations is a vector space, one must show

that EVERY axiom holds. None can be skipped.

I. Stating w/o proof.

You have stated something that, while (likely) true, needs to be proven. For example, if you are asked to find a basis for the span of a set of vectors, one needs to not only give such a basis, but to show that it is in fact a basis. Sometimes this may seem obvious, and sometimes the steps to show such things are in fact trivial, but the step is crucial none the less.

J. Unnecessary.

You have shown something much more complicated than is needed, or you have done some completely unnecessary steps here. For example, to show a set with some operations is not a vector space, all one needs to do is show one axiom of a vector space fails in one specific case.

K. Does not make sense.

What you have written here does not make sense. For example, you may have written "=", when in fact what you meant was "implies that". Or perhaps you have added two vectors and gotten a real number.

S. A cop-out.

Something here is fairly obvious and fairly tedious to do, however you should really still do it, for practice and to make sure you understand why it is obvious and tedious.

T. Wrong Question.

You copied the question down wrong, or you did not read the question carefully. Please make sure you do from now on.

U. Matrix without brackets.

You have written a matrix without brackets on the side. What makes you think this is ok? I have never seen it taught this way in all my years of mathematics, and yet many do it. I can't see why. I would consider it unacceptable.

V. Understanding.

It is clear from what you have written that you do not understand what is going on here. Be aware that if you are getting this error, I believe you do **not** understand what is going on. **You should probably come to see me to help correct your understanding.**

W. Math error.

You have made an actual mathematical error here.

Y. Illegal move.

You have done something that is not allowed. For example, multiplying rows as a row operation, dividing by 0, etc.

Z. Typo.

You have made a simple typo.