# Some tips for writing proofs



1. Be clear about what is the proposition ~~to be proved~~: what is given (hypotheses / assumptions), and what is the desired conclusion. Recommended: Write Given and RTP (Required To be Proved) at the start of the proof.
   - This is particularly necessary for "if and only if" propositions. Forward and backward directions should be specified. Sometimes, a student starts writing, and not being clear, ends up by proving what was already given.
2. Pay attention to notation.
   - Write down what each character ($x, y, z, \ldots, a, b, c, \ldots; \alpha, \beta, \gamma, \ldots, A, B, C, \ldots$, etc) stands for; do not introduce a new character without stating what it stands for.

TIPS - continued

- Do not use the same character for two different objects.
- In LA, clearly distinguish vectors and scalars (I use $\vec{u}$ for a vector)

3. Check that each statement (step) in the proof is one of the 4 + legitimate ones allowed (a., b., c., d. in notes for Monday 20230821).
   - A common error is to write a statement which is not a known result. Often, it turns out to be FALSE or just as hard to prove as the desired conclusion.

4. Use short statements as steps in the proof - one simple sentence, with if necessary an explanation - put in brackets if appropriate. A proof should not contain long, complicated sentences or paragraphs.

# TIPS - cont'd

5. Use mathematical language and symbols/equations as far as possible. Natural language is often imprecise; mathematical language is precise.

6. Objective of the proof :- every proof has to be written for a human reader. It has to be appropriate for the reader. For example:
   (a) Proofs in journal articles - by experts for experts - brief and with many steps left out.
   (b) Textbooks and lecture notes: for learners. Steps are not left out (usually!) and there are extra explanations not ≠ strictly part of the proof.
   (c) By a student in a test: your objective is to convince the checkers that you have understood the logic. Do not leave gaps, and cite used results explicitly.