

Homework Writeup Requirements

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1 Goals and Policies

The goal for each homework is not only for you to understand better the subject but also to simulate a scenario where you are leading a project in your senior year of your PhD. You are the only expert in this project. Even your advisor does not know much about the project. You do not really have many resources except for Google. To this end, I will implement the following two policies:

- **Discussions with classmates are prohibited;**
- **You are welcome to use Google.**

2 Scientific Writing

Your writeup is arguably the most important part of your “research” because it communicates with others your innovations. Besides correctness, I have the following requirements.

You must use math language. For example, when you try to define the limit of a sequence, you cannot say it is something that the sequence will be close to eventually. This is human language and is not even wrong. You must use ϵ - δ language to make it rigorous.

Every notation must be well defined. You can use the definitions in UML directly. For anything that is not defined in UML, you must define it first before using it.

Every step must be clearly explained. You must add explanations for each equality or inequality you write if it is beyond basic algebraic manipulation. Following is a good example for proving $a^2 + b^2 + c^2 \geq \frac{1}{a} + \frac{1}{b} + \frac{1}{c}$ assuming $abc = 1$:

$$\begin{aligned} & a^2 + b^2 + c^2 \\ &= \frac{1}{2} (a^2 + b^2 + b^2 + c^2 + c^2 + a^2) \\ &\geq \frac{1}{2} (2ab + 2bc + 2ca) \quad (\text{By } x^2 + y^2 \geq 2xy) \\ &= \frac{1}{c} + \frac{1}{b} + \frac{1}{c} \quad (\text{By } abc = 1) \quad . \end{aligned}$$

Following is a bad example:

$$\begin{aligned} & a^2 + b^2 + c^2 \\ &\geq ab + bc + ca \\ &= \frac{1}{c} + \frac{1}{b} + \frac{1}{c} . \end{aligned}$$

If you ever doubt whether you need to add an explanation, then just add one. For explanations, you can refer to results from other papers or textbooks (with proper citations). But you **cannot** refer to a web link or Wikipedia.