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Submitted by <name>

We're in the final stretch and you have now learned enough material to sit at the frontier of quantum learning theory research. In this final assignment, you will have an opportunity to explore what it takes to push this frontier further.

For this assignment, you are allowed (and strongly encouraged) to use large language models to assist you in scouring the literature, but you will not be allowed to use it to generate your final written response. You will be responsible for fact-checking any pointers to the literature suggested by the models, and we will deduct points for hallucinated citations.

## 1 (100 PTS.) HOW TO FORMULATE A RESEARCH QUESTION

For any topic that was covered in the course, formulate at least one **follow-up question** that was not answered in lecture and provide:

- A summary of which lecture material is relevant to the question(s).
- A high-level discussion for why the question(s) is/are well-motivated either mathematically or experimentally.
- A mathematically precise formulation of the question(s), complete with relevant notational setup. Some research directions are more open-ended, so this does not necessarily have to be the "ultimate version" of the question(s), but it should be an earnest initial attempt.
- A brief summary of why the techniques used in class fall short of answering the question(s).
- A brief overview of relevant research papers that, either directly or indirectly, shed light on the proposed question(s). These can include but ideally should not be limited to papers from the suggested reading on the course webpage. This does not by any means need to be an exhaustive literature review, but your writing here should reflect that you engaged with material beyond the confines of the class.
- Speculation on what it would take to resolve the question(s).

The relative lengths for these components can vary depending on the topic you choose, but your overall response should fill up roughly **3/4 to 1 full page of text** (1-inch margins, 11-point font, single spacing), plus a **separate page providing a bibliography**.