

## How to Survive a Math/Proof-Heavy Exam

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CPS 271

## Basic Assumption

- Prof intended exam to be doable in exam time
- Implications:
  - Most or all problems should have simple answers
  - Spend more time thinking, less time writing
  - Focus on the big picture
- Ask yourself:
  - What is the basic insight behind the question?
  - What is shortest path to demonstrate this insight?

## Prepare Yourself Mentally

- Don't panic!
- Read all questions carefully
- Ask for clarification if needed  
(prof takes no pleasure in tricking/confusing you)
- Don't panic!
- Start answering easiest questions first
  - Reread question before you start writing
  - Reread question after you are done to make sure you have answered the question
- Don't panic!

## How to Attack Proofs

- Consider options before you start writing
- Frontal assault (direct/algebraic proof)
  - Usually the easiest to start
  - Often requires more algebra/calculation/writing
- Induction
  - Requires more subtle thinking
  - Can sometimes lead to shorter/more elegant proofs
  - Doesn't always work out
- Sneak attack (proof by contradiction)
  - Requires more planning at first
  - Can lead to very, very short proofs

## How to Find Examples/Counterexamples

- Develop intuition about what you want to show
- Try to find a low dimensional example (Don't waste time dealing with 3,4,5,... dimensions if 1 or 2 will suffice.)
- Consider boundary and degenerate cases  
(remember assumption that exam should be doable)
  - Consider -1,0,1
  - Consider making variables equal
  - (Even if these don't work, they help give you insight into what will work)
- The smaller the example, the easier it is to write up, and the more time you have for the next problem

## Check Your Answers

- Did you answer the question?
- Have you proved both directions of biconditionals?
- Are all of your probabilities between 0 and 1?
- Are all of your probability densities non-negative?
- Do they integrate to 1?
- Plug in some trivial cases (0,1,etc.) to make sure your answer makes sense
- Check matrix dimensions

### Other Tips

- Don't panic!
- Use a pencil
- Challenge yourself while studying:
  - Studying != memorization
  - Exam questions != homework questions with different numbers
  - Do I understand the boundary conditions?
  - How does one method differ from another?
  - What are the pros and cons?
- Don't panic!

### Why This Matters

- Wait a minute... I thought grades didn't matter (much) in graduate school!
- True, but
  - Understanding matters
  - Learning to communicate your understanding in a succinct manner really, really matters