

Your name: _____

andrew id: _____

Instructions.

- Please put away all electronic devices (cell phones, smart watches, etc.)
- Please write your name and andrew id above, as indicated.
- The final is from 8:30am to 11:30am. Please do not leave within the last 10 minutes.
- You may cite any theorems from lecture. You may not cite any problems from the homework.
- If $f(n) \geq n \log n$ is a “reasonable-looking” function, you may assert without proof that it is time-constructible — unless proving that is the explicit point of the problem. Similarly for asserting that a “reasonable-looking” $f(n) \geq \log n$ is space-constructible.
- Unless otherwise specified, assume all languages are subsets of $\{0, 1\}^*$.
- Unless otherwise specified, you can write all algorithms in pseudocode. Very often you will need to prove that your pseudocode: (a) uses at most a certain amount of resources (e.g., polynomial time); (b) is correct.

In many cases, (a) is fairly clear. In such case, you may simply assert the resource bound (e.g., in the form of a “comment” on your pseudocode); however, don’t forget to assert it every time you need to, and make sure you are careful about what the asserted bound is and what the input length parameter is.

Regarding (b), correctness, for some problems this is the whole point, and we suggest you write a complete proof. For other problems, it may be fairly clear that certain steps in an algorithm are “correct” and we recommend you indicate that to the graders briefly in the form of “comments/assertions” within your pseudocode. Use your judgment, and always be clear about what correctness statement you’re asserting.

- There are 3 parts to the midterm, with 88 points in total:
 - **True/False/Unknown, 22 total points, pages 2–3.** For each statement, write “True” / “T” if it is known to be true, “False” / “F”, if it is known to be false, or “Unknown” / “U” if no one knows. Three problems marked “(T/F)” are definitional in nature, and will not have answer “Unknown”.
 - **Short answer, 21 total points, pages 4–6.** For these problems, you only need to write the correct answer. There are 7 problems, each worth 3 points.
 - **Longer problems, 45 total points, pages 7–15.** For these problems, you are required to write complete proofs. Please write your solutions clearly, concisely, and completely. As on the homework, style counts. There are 9 longer problems, each worth 5 points.