**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 midterm is from 9:00am to 10:20am.

- You may cite any theorems from lecture, including the NP-completeness of all languages discussed in Lecture 12. You may not cite any problems from the homework.

- If $f(n) \geq n$ is a "reasonable-looking" function, you may assert without proof that it is time-constructible.

- Unless directed otherwise, you may write algorithms in pseudocode.

- When describing pseudocode, if it is pretty clear that it is implementable in polynomial time (e.g., it only does some simple stuff like interpret encodings, basic string manipulation, loops that clearly iterate at most poly($n$) times, etc.), you may simply assert that. (Don't forget to assert it every time you need it, though.) You must always be accurate about what the input length is, and why the algorithm is polynomial time in *that input length*.

- In writing algorithms, please clearly write things like "The algorithm interprets string $x$ as *(mathematical object $Z$)*..." whenever appropriate.

- In describing an algorithm for a problem, if it is pretty clear that it is correct, you may assert this, but please: a) carefully describe *what correctness statement you're asserting*; b) make sure to explain details about any subtle points or edge cases, as necessary.

- There are two parts to the midterm, with 55 points in total:

    - **Short answer, 20 total points, pages 2–4.** For these problems, you only need to write the correct answer; you don't need to write an explanation. (Exception: the one problem where you are asked, "Explain in a couple of sentences why...".) There are 11 true/false/unknown problems worth 1 point each, and 3 additional problems worth 3 points each.

    - **Longer problems, 35 total points, pages 5–11.** For these problems, you are required to write complete proofs. Please write your solutions clearly, concisely, and completely. As on the homework, writing style counts. There are 3 longer problems, worth 10, 10, and 15 points.