

The third midterm will test material covered in lectures 20 through 24.

Specific skills that may be tested include (the following list may not be exhaustive):

- 1.** Reductions
 1. Knowing how to reduce one problem to another
 2. Understanding what each reduction direction proves.
- 2.** Undecidability
 1. Knowledge that halting is undecidable.
 2. Ability to prove that problems on program behavior are undecidable via reductions from *HALT*.
- 3.** NP, NP-Completeness and Polynomial-time Reductions
 1. Definitions of NP, NP-Complete, NP-Hard
 2. Knowledge of standard NP-Complete problems: SAT, 3SAT, CircuitSAT, Independent Set, Clique, Vertex Cover, Hamiltonian Cycle/Path in directed/undirected graphs, 3Color, Color.
 3. Ability to prove that a given problem is in NP
 4. Ability to prove that a given problem is NP-Hard via a polynomial time reduction from an existing NP-Hard problem from the given list.
 5. Understand the definition of a polynomial-time reduction and its implications.
 6. Ability to prove correctness of reductions
 7. Understand basic boolean logic and properties of SAT/CircuitSAT formulas to enable reductions