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