Chapter 1

Decidability

Chapter 2

Reduction

Reduction is the primary method by which we prove that problems are computationally unsolvable. It converts a problem to a simpler problem in such a way that the simpler problem can be used to solve the original one.

As we've shown in the previous chapter, A_{TM} is an undecidable language. We will reduce problems that seem complex to the simpler A_{TM} problem.

Technique 2.0.1 ▸ Reduction

To prove that a problem P is undecidable by reduction:

1. Find a problem Q known to be undecidable.
2. Assume P is decidable by a TM, say M_P.
3. Use M_P to construct a TM M_Q that solves Q: encode every instance q of problem Q as an instance q_P of problem P.

Chapter 3

Complexity

Complexity in terms of Turing Machines deals with the number of steps the machine takes to finish computation. In general, the running time of an algorithm is a function of the length of the string that represents the input.