29 Lecture - CS402

Important Subjective

1. **Define decidability.**
   Answer: Decidability is a property of a problem or language, which refers to the ability to determine whether a given input belongs to the problem or language in a finite amount of time.

   What is the difference between a decidable language and an undecidable language?
   Answer: A decidable language is one for which there exists an algorithm that can determine whether a given input belongs to the language in a finite amount of time. An undecidable language, on the other hand, is one for which no such algorithm exists.

   What is the halting problem?
   Answer: The halting problem is the problem of determining, for a given input and program, whether the program will eventually halt or run forever.

   What is the Rice Theorem used for?
   Answer: The Rice Theorem is used to prove the undecidability of problems.

   What is the difference between a decidable problem and a problem that is solvable in polynomial time?
   Answer: A decidable problem is one for which there exists an algorithm that can determine whether a given input belongs to the problem in a finite amount of time. A problem that is solvable in polynomial time, on the other hand, is one for which there exists an algorithm that can solve the problem in a number of steps that is proportional to the input size raised to some fixed power.

   What is the Church-Turing Thesis?
   Answer: The Church-Turing Thesis states that any problem that can be solved by an algorithm can be solved by a Turing machine, and vice versa.

   What is the difference between a language that is decidable and a language that is semi-decidable?
   Answer: A language that is decidable is one for which there exists an algorithm that can determine whether a given input belongs to the language in a finite amount of time. A language that is semi-decidable, on the other hand, is one for which there exists an algorithm that can accept any input that belongs to the language, but may not halt on inputs that do not belong to the language.

   Can a language be both decidable and semi-decidable?
   Answer: Yes, a language can be both decidable and semi-decidable. An example of such a language is the set of even numbers.

   What is the difference between decidability and computability?
   Answer: Decidability refers to the ability to determine whether a given input belongs to a problem or language in a finite amount of time, while computability refers to the ability to solve a

problem using an algorithm.

Is there a relationship between decidability and complexity?
Answer: Yes, there is a relationship between decidability and complexity. Decidable problems are typically those that are solvable in polynomial time, while undecidable problems are typically those that are at least as hard as the halting problem, which is known to be unsolvable in any amount of time.