CSI 350
Practice Part #4

1. Understand S_{tm}.

   (a) What does it mean?

   (b) Which machines belong in it?

   (c) Is it recognizable? If so, provide a recognizer. If not, prove it.

2. Understanding A_{tm}.

   (a) What does it mean?

   (b) Which machines belong in it?

   (c) Is it recognizable? If so, provide a recognizer. If not, prove it.

   (d) Is it decidable? If so, provide a decider. If not, prove it.

3. Understanding $HALT_{tm}$.

   (a) What does it mean?

   (b) Which machines belong in it?

   (c) Is it recognizable? If so, provide a recognizer. If not, prove it.

4. Understand countable infinities. Is the set of integers countable? How about the set of all 3D Points?

5. Is the power set of the natural numbers countable? (14.3 is very important here)

6. Understand the idea of diagonalization (14.1 is a simple version). How does it prove that reals aren't countable? How can we use it to prove 14.3a?

7. Understand Reductions (15.1)

   (a) We can solve A in the presence of B if A reduces to B.

   (b) If A reduces to B and B is decidable, then A is decidable

   (c) If A reduces to B and A is undecidable, then B must also be undecidable.

8. Questions about TMs (15.2, 15.3, 15.4, 15.5, 15.6, 15.7, 15.8)

   (a) Is it decidable if a TM ever accepts the string 'a'?

   (b) What theorem gives us the answer?

   (c) How do we prove this without the presence of that theorem?

   (d) Prove it without the theorem.

9. What is the class P?

10. What is the class NP?

11. What is the class PSPACE?

12. What is the class NPSPACE?

13. What is the relationship between P and NP? (P $\subseteq$ NP)

14. What is the relationship between PSPACE and NPSPACE (PSPACE = NPSPACE)

15. How about all P, NP, PSPACE and NPSPACE?