1. **(25 points):** Kozen HW 9, Question 3
   Prove that the emptiness problem for linear bounded automata is undecidable.

2. **(25 points):** Kozen HW 10, Question 1
   Show that neither the set
   $$\text{TOTAL} \overset{\text{def}}{=} \{M \mid M \text{ halts on all inputs}\}$$
   nor its complement is r.e.

3. **(25 points):** Kozen HW 10, Question 3
   Show that it is undecidable whether the intersection of two CFLs is non-empty.

4. **(25 points):** Kozen Miscellaneous Exercises, Question 103.
   A nondeterministic Turing machine is on ewith a multiple-valued transition relation. Give a formal definition of these machines. Argue that every nondeterministic TM can be simulated by a deterministic TM.