Problem 1. Prove that a language $L$ is decidable if and only if there is an enumerator that prints the strings of $L$ in proper (canonical) order.

Problem 2. Formulate the following problem as a language and then prove that it is decidable:

Given a Turing Machine $M$ and an input string $w$ determine whether $M$ moves its head to the left during the computation on input string $w$.

Problem 3. Formulate the following problems as a language and then prove that it is undecidable:

Given a Turing machine $M$ a string $w$ and a symbol $x$, determine whether $M$ writes symbol $x$ on the tape during the computation on input string $w$.

Hint: use a similar reduction as in the state-entry problem which we described in class.

Problem 4. Formulate the following problem as a language and then prove that it is undecidable:

Given a Turing machine $M$ determine whether $L(M) = \{\text{Have, A, Great, Summer}\}$.

Hint: use a similar reduction as in the Empty, Regular, and Size-2 language problems which we described in class.