1. Prove that it is undecidable whether a given program computes a total function. Hint: show that it is undecidable whether a program computes the identity function, and derive the more general result from this.

2. List the first 10 elements of D as given in Lemma 5.7.1.

3. Show that it is not necessary to assume that every memory cell is initialized to 0.

4. Show that function $x + 1$ is computable by a Turing Machine, if given as input the binary representation of $x$.

5. Show that a Turing Machine can, given input of form $xBy$ where $y, x \in \{0, 1\}^*$, decide whether $x = y$. An alphabet larger than $\{0, 1, B\}$ may be assumed, if convenient.

6. Show that a counter machine can compute function $x + y, 2 \cdot x, x/2$. 