In-class Exercises Turing Machines

1. Construct Turing machines (provide a full diagram) that decide the languages:

\{0\}

\{00, 000\}

\{\varepsilon, 00, 0000, 000000, \ldots\} (i.e., strings of 0's of even length).
2. Construct a Turing machine (provide a full diagram) that decides the language:

\[ \#0^n++ = 0^m \mid m = n + 1 \]
3. Construct a *multitape* Turing machine that uses three tapes to decide the language:

\[ \{#0^n = 0^m \mid n = m\} \]
4. Construct a *multitape* Turing machine that uses four tapes to decide the language:

\[
\{#x_1#x_2#x_3#x_4 \mid x_i \in \{0, 1\}^* \text{ and } x_i \neq x_j \text{ for each } i \neq j\}
\]