

Refer theorem 5.2 in the textbook. It states that E_{TM} is undecidable. It is known that A_{TM} is Turing recognizable but not co-Turing recognizable.

The complement of E_{TM} is denoted with $\overline{E_{TM}}$. The TM for $\overline{E_{TM}}$ is as follows:

M="On input $\langle M \rangle$,

- 1. For $l = 1, 2, 3, \dots$**
 - a. Run M on all strings of length l for l steps.**
 - b. If any string is accepted then accept.**
- 2. Reject if no string is accepted."**

There exists a TM that recognizes $\overline{E_{TM}}$. Thus, E_{TM} is co-Turing recognizable.

Assume that A_{TM} is mapping reducible to E_{TM} . Thus, $\overline{A_{TM}}$ is mapping reducible to $\overline{E_{TM}}$. $\overline{A_{TM}}$ is not Turing recognizable but $\overline{E_{TM}}$ is Turing recognizable which is a contradiction to the theorem 5.28. This a contradiction to the earlier assumption.

Therefore, A_{TM} is not mapping reducible to E_{TM} .