1) Show that $E_{CFG}$ is undecidable. Hint: Use the fact that $ALL_{CFG}$ is undecidable (as stated in Theorem 5.13 on page 225).

2) Show that $E_{CFG}$ is co-Turing-recognizable.

3) Let $T = \{ <M> | M$ is a TM that accepts $w^R$ whenever it accepts $w \}$. Show that $T$ is undecidable.

4) Consider the problem of determining whether a single-tape Turing machine ever writes a blank symbol over a nonblank symbol during the course of its computation on any input string. Formulate this problem as a language and show that it is undecidable.

5) Consider the problem of determining whether a Turing machine $M$ on an input $w$ ever attempts to move its head left when its head is on the left-most tape cell. Formulate this problem as a language and show that it is undecidable.