Problem 1

(a)

$$\textsc{Win}(\mathbf{x}) = \begin{cases} \mathbf{F} & \text{if } \mathbf{x} = (1,0,\ldots,0) \\ \bigvee_{\mathbf{x}' \in \textsc{Next}(\mathbf{x})} \neg(\textsc{Win}(\mathbf{x}')) & \text{otherwise} \end{cases}$$

(b) The recurrence is split into two cases: the base case with $\mathbf{x} = (1,0,\ldots,0)$ and the recursive case, where we check if a losing position exists from any valid move. For the base case, it is quite clear that the only move is to bite the poisoned piece and lose.

To reiterate the general observation in the assignment's description: $\mathbf{x}$ is a winning position iff there exists a losing position $\mathbf{x}'$ such that $\mathbf{x} \to \mathbf{x}'$ is a legal move. In the recursive case, if some $\mathbf{x}' \in \textsc{Next}(\mathbf{x})$ is a losing position, then $\neg\textsc{Win}(\mathbf{x}') = \mathbf{T}$ and thus,

$$\textsc{Win}(\mathbf{x}) = \bigvee_{\mathbf{x}' \in \textsc{Next}(\mathbf{x})} \neg\big(\textsc{Win}(\mathbf{x}')\big) = \mathbf{T}.$$

Note that the recursion converges to the base case $\mathbf{x} = (1,0,\ldots,0)$ since a legal move yields a strictly decreasing measure of less chocolate squares (per the game description).