Problem 1

The Japanese game *go-moku* is played by two players, “X” and “O,” on a $19 \times 19$ grid. Players take turns placing markers, and the first player to achieve five of her markers consecutively in a row, column, or diagonal is the winner. Consider this game generalized to an $n \times n$ board. Let

$$GM = \{ \langle B \rangle \mid B \text{ is a position in go-moku where player “X” has a winning strategy} \}$$

By a *position* we mean a board with markers placed on it such as may occur in the middle of a play of the game, together with an indication of which player moves next. Show that $GM \in \text{PSAPCE}$. 