Honors HW04. Morally DUE Mon Mar 28

A linear ordering \( L \) has the **Levin property** if the following hold:

- There exists a \( MIN \) element.
  Formally
  \[
  (\exists x)(\forall y)[x \leq y].
  \]
  In later problems we will call this \( x \ MIN \).

- There exists a \( MAX \) element.
  Formally
  \[
  (\exists y)(\forall x)[x \leq y].
  \]
  In later problems we will call this \( x \ MAX \).

- For all \( y \neq MIN \) there is an element \( x \) such that \( x < y \) and there is nothing inbetween \( x \) and \( y \).
  Formally
  \[
  (\forall y \neq MIN)(\exists x)[x < y \land (\forall z)[(z \leq x) \lor (z \geq y)]].
  \]

- For all \( x \neq MAX \) there is an element \( y \) such that \( x < y \) and there is nothing inbetween \( x \) and \( y \).
  Formally
  \[
  (\forall x \neq MAX)(\exists y)[x < y \land (\forall z)[(z \leq x) \lor (z \geq y)]].
  \]

1. (50 points) Give an example of an ordering \( L \) with the Levin Property such that \( E \) wins the Emptier-Filler game with ordering \( L \).

2. (50 points) Give an example of an ordering \( L \) with the Levin Property such that \( F \) wins the Emptier-Filler game with ordering \( L \).