Half of part (a)

Proof. Assume that there exists \( a \in A \) such that for all \( n \in \mathbb{N} \) there exists \( j \geq n \) such that \( s_j = a \).

Construct \( S_n \) through induction.

Base Case: Let \( n = 1 \). There exists \( j \geq n \) such that \( S_j = a \). So, \( S_{n_1} = S_j = a \).

Induction Step: Assume up through \( S_{n_x} = a \) where \( n \) is an index of the original sequence. We know that \( n + 1 \) is a natural number, so there is a \( k \geq n + 1 \) such that \( S_k = a \). Therefore, we let \( S_{n(x+1)} = S_k = a \).