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and $a_{n_1} \leq a_{n_2} \leq \cdots$

Case 2 $|J| < \infty$ one and

Take any $n_1 > \max J$ $\leftarrow J$

By construction, if n_2 is large enough $n_2 > n_1$ and $a_{n_2} < a_{n_1}$

By induction, having constructed $n_1 < n_2 < \cdots < n_k$ s.t. $a_{n_1} > a_{n_2} > \cdots > a_{n_k}$

$\exists\ n_{k+1} > n_k$ s.t.

$a_{n_{k+1}} < a_{n_k}$.

and so the Thm holds