I. Prove that
\[ \lim_{n \to \infty} \frac{1}{\sqrt{n}} = 0 \]
for any fixed \( k \in \mathbb{N} \).

II. (a) Give examples of sequences \( \{a_n\}, \{b_n\} \) which both diverge, yet \( \{a_n b_n\} \) converges.

(b) Give examples of sequences \( \{a_n\}, \{b_n\} \) which both diverge, yet \( \{a_n + b_n\} \) converges.