Exercise 1. *Let $f : (a, b) \to \mathbb{R}$ be a bounded, monotonic function. Prove that*

$$\lim_{x \to a^+} f(x) \quad \text{and} \quad \lim_{x \to b^-} f(x)$$

exist.

Exercise 2. *Let $f \in C(a, b)$. Assume that*

$$\lim_{x \to a^+} f(x) = A \quad \text{and} \quad \lim_{x \to b^-} f(x) = B$$

exist, prove that

(1) f is bounded on (a, b);

(2) f is uniformly countinuous on (a, b);

(3) If $AB < 0$, then $\exists \eta \in (a, b)$ such that $f(\eta) = 0$.