Note: This is a shorter than usual homework! You will be receiving a take-home midterm on Wednesday, so you will want to get a head start on the current homework this weekend.

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1. Suppose $f : A \to \mathbb{R}$, $c \in A$, and c is a limit point of both $A \cap (c, \infty)$ and $A \cap (-\infty, c)$. Prove that $\lim_{x \to c} f(x)$ exists and equals L if and only if $\lim_{x \to c^+} f(x)$ and $\lim_{x \to c^-} f(x)$ both exist and are equal to L.

2. 4.6.4

3. 4.5.4 (*Hint:* What happens when a monotone increasing function is discontinuous?)

4. 4.4.2

5. Suppose $f : A \to \mathbb{R}$ is uniformly continuous. Prove that f takes Cauchy sequences to Cauchy sequences. Also, find a function $f : (0, 1] \to \mathbb{R}$ that is continuous but does not take always take Cauchy sequences to Cauchy sequences.