

Homework 9

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4.3

2. Let $f(x) := \sin(1/x)$ for $x < 0$ and $f(x) := 0$ for $x > 0$.

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5.1

5. Yes. Define $f(2) := \lim_{x \rightarrow 2} f(x) = 5$.

6. Given $\varepsilon > 0$, choose $\delta > 0$ such that if $x \in V_\delta(c) \cap A$, then $|f(x) - f(c)| < \varepsilon/2$. Then if $y \in V_\delta(c) \cap A$, we have $|f(y) - f(x)| \leq |f(x) - f(c)| + |f(c) - f(y)| < \varepsilon/2 + \varepsilon/2 = \varepsilon$.

11. Let $c \in \mathbb{R}$ be given and let $\varepsilon > 0$. If $|x - c| < \varepsilon/K$, then $|f(x) - f(c)| \leq K|x - c| < K(\varepsilon/K) = \varepsilon$.

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5.2

5. The function g is not continuous at $1 = f(0)$.

7. Let $f(x) := 1$ if x is rational, and $f(x) := -1$ if x is irrational.

11. If $h(x) := f(x) - g(x)$, then h is continuous and $S = \{x \in \mathbb{R} : h(x) \geq 0\}$.