

PROBLEM SET NO. 4 (DUE ON MONDAY, OCTOBER 27 AT
4:00 PM)

MONDAY, 10-20

- **Problem 1:** In lecture we discussed so called *improper limits*, i.e. limits which attain the values $\pm\infty$. The adjective “improper” is added, as our original definition of the limit of a function requires the latter to be a real number. Looking at other similar definitions from lecture (and set 3), give definitions of the following *improper* limits:
 $\lim_{x \rightarrow +\infty} f(x) = +\infty$, $\lim_{x \rightarrow +\infty} f(x) = -\infty$.
- **Problem 2:** The Dirichlet jump function $g : \mathbb{R} \rightarrow \mathbb{R}$ is defined by $g(x) = 0$ if $x \notin \mathbb{Q}$ and $g(x) = 1$ if $x \in \mathbb{Q}$. Show that g is not continuous at any point $x \in \mathbb{R}$.