

Mathematics 3790H – Analysis I: Real analysis
TRENT UNIVERSITY, Winter 2015

Assignment #8
Unbounded variation
Due on Friday, 6 March, 2015.

Recall that $f(x)$ is *uniformly continuous* on an interval I if for every $\varepsilon > 0$ there is a $\delta > 0$ such that for all $u, v \in I$, if $|u - v| < \delta$, then $|f(u) - f(v)| < \varepsilon$.

1. Show that the derivative of $f(x) = \sin\left(\frac{1}{x}\right)$ is unbounded on the interval $(0, 1)$. [3]
2. Show that $f(x) = \sin\left(\frac{1}{x}\right)$ is not uniformly continuous on the interval $(0, 1)$. [7]