# Homework 9 - Math 431
# Due Apr 9th


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| Instructor | Mauro Maggioni |
| Office | 319 Gross Hall |
| Office hours | 1:30-2:30pm |
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**Problems**:
§4.3: #11(a,e)
§4.6: #5(c,d,e) (give reasons)
§5.1: #1,4,11
§5.2: #9,15

**Additional Problems:**

1. In §4.3: #11(a) above you showed that $\ln x \to \infty$ as $x \to \infty$. Use a similar argument to show that

$$\int_{\frac{1}{n}}^{1} \frac{dt}{t} \to \infty$$

as $n \to \infty$. (Pick an appropriate partition $P$ of $[\frac{1}{n}, 1]$ and show that the corresponding lower sum tends to $\infty$ as $n \to \infty$.) Conclude that $\ln x \to -\infty$ as $x \to 0$.

2. Let $\{f_n(x)\}$ be a sequence of functions which converges pointwise to a function $f(x)$ on some subset $E \subseteq \mathbb{R}$. Suppose there exists a sequence $\{x_n\} \subseteq E$ and a positive number $c$ such that $|f_n(x_n) - f(x_n)| > c$, for all $n$. Prove that $\{f_n(x)\}$ does not converge uniformly to $f(x)$ on $E$.