

HOMEWORK 13

- 1) True or false (some of these relate to 2.1 and 2.2 as well as 2.3)
 - a) If $\{a_n\} \rightarrow a$ and $\{b_n\} \rightarrow b$ and $a < b$ then there exists $N \in \mathbb{N}$ such that $n \geq N$ implies $a_n < b_n$.
 - b) If $\{a_n\} \rightarrow a$ and $\{b_n\} \rightarrow b$ and $a \leq b$ then there exists $N \in \mathbb{N}$ such that $n \geq N$ implies $a_n \leq b_n$.
 - c) If S is a bounded set of real numbers that contains its Supremum and Infimum, then S is a closed interval.
 - d) If $\{x_n\}$ is not monotone then it has no limit.
 - e) If $b \leq L + \epsilon$ for all $\epsilon > 0$, then $b \leq L$.
- 2) Let $x_n = \frac{1}{2n+1} + \frac{1}{2n+2} + \cdots + \frac{1}{3n}$ for all $n \in \mathbb{N}$. Prove the limit of $\{x_n\}$ exists using the monotone convergence theorem.
- 3) Let $y_n = \frac{3n-1}{8n-2}$ for all $n \in \mathbb{N}$. Prove that y_n converges using the monotone convergence theorem.