Homework for Math 352
Spring 2020

Hwk Set 5. Due Monday, February 10.

1. For each sequence below compute the first ten terms and plot these on the real number line. Find the inf, and sup of the underlying sets. Find the lim inf and lim sup of these sequences.
   (a) $\left\{ \frac{(-1)^n}{n} + (-1)^{n+1} \,\middle|\, n = 1, 2, 3, \dots \right\}$.
   (b) $\left\{ (n \mod 3) + (-1)^n/n^2 \,\middle|\, n = 1, 2, 3, \dots \right\}$
   (c) $\left\{ (n \mod 3) - (-1)^n/n^2 \,\middle|\, n = 1, 2, 3, \dots \right\}$
   (d) $\left\{ \cos(n\pi/2) + (-1)^n/n \,\middle|\, n = 1, 2, 3, \dots \right\}$
2. Suppose $a_n \leq b_n \leq c_n$ for all $n \in \mathbb{N}$ and that $L \in \mathbb{R}$. Suppose that $a_n \to L$ and $c_n \to L$. Prove that $b_n \to L$. This is called the Squeeze Theorem.
3. Suppose $a_n \to L \in \mathbb{R}$. Prove that $|a_n| \to |L|$.
4. Suppose $a_n \leq b_n$ for all $n \in \mathbb{N}$. Prove that if $a_n \to \infty$, then $b_n \to \infty$.
5. Do Exercise 9.18 parts (b) & (c) on page 56. You did part (a) already. This is a standard test question.
6. (Bonus!) The textbook makes use of the binomial theorem several times. The proof is Exercise 1.12 parts (a), (b) & (c) on page 6. Do these!