**Math 3515: Homework 3**

1. If converges to and converges to , and in addition , does that imply that ? Is there anything else that you can conclude about and ? Prove it.
2. If and for all , show that the sequence converges and find the limit.
3. Suppose and for all . Could you use Prop 3.1.9 to prove that the sequence converges (you don’t have to provide a proof whether the sequence converges or not)? Assume that the sequence does converge. What would its limit be?
4. Compute and for

1. Prove that if all lim sups are finite and find an example where equality does not hold.
2. Let be a real sequence satisfying for all *n*, p. Show that the sequence converges.
3. Show that if converges to x, then converges to x. Note that the sequence of algebraic means generated from the is called Cesaro Means.
4. Find a sequence whose Cesaro means converge, but the original sequence does not.
5. Show that if , for all n, converges to x, then the sequence of geometric means also converges to x. Hint: Look at Cesaro Means and try the natural log.
6. In the proof of the Bolzano Weierstrass theorem 3.3.4, we need to find a certain integer *N* to finish the proof. What is that *N*, and how would the finished proof go?