

**MATH 300. INTRODUCTION TO
MATHEMATICAL REASONING.
FALL 2015.
WEEK 12 (LECTURE 25-26).
LIMITS OF SEQUENCES**

1. Reading: Lecture Notes of Lectures 25,26.
2. Home assignment (Due Monday, December 7) (to submit).
 1. Find limits if $n \rightarrow \infty$ of the following sequences, if they exist, and prove it using directly the definition:

$$x_n = \frac{(-1)^n}{n^2}, x_n = \frac{1}{3n-2},$$

$$x_n = \frac{\cos n}{n}, x_n = \frac{n^2}{n^2+3},$$

$$x_n = 2^n/3, x_n = n!.$$

2. The same assignment as in Problem 1 but you can apply some theorems on limits

$$x_n = \frac{3n^2 - 3n + 1}{6n^2 + 2n + 1}, x_n = \frac{2n^2 - 5}{3n^3 + 6},$$

$$x_n = \frac{2n^2 - 5}{3n^3 + 6}, x_n = \frac{2^n - 3^n}{4^n},$$

$$x_n = n^3, x_n = \cos n\pi.$$

3. Prove that
 - 1) Prove that the limit of a convergent sequence is unique.
 - 2) If to change in a convergent sequence a finite number of terms then the new sequence will converge to the same limit.