

### Math 400: Discussion Questions # 4

A statement listed with [T/F] is a True/False statement that requires a proof or a counterexample, as appropriate.

1. [T/F] Every monotone sequence is convergent.
2. [T/F] Every convergent sequence is monotone.
3. [T/F] If a sequence is monotone and bounded, then it is convergent.
4. [T/F] If  $(a_n)$  is a sequence of positive real numbers, then the sequence of partial sums of the series  $\sum_{n=1}^{\infty} a_n$  forms a bounded sequence.
5. [T/F] If  $(a_n)$  is a sequence of positive real numbers, then the sequence of partial sums of the series  $\sum_{n=1}^{\infty} a_n$  forms a monotone sequence.
6. [T/F] The following series converges:  $\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$ .
7. [T/F] If  $(a_n)$  converges to 0 then  $\sum_{n=1}^{\infty} a_n$  converges.
8. [T/F] If  $\sum_{n=1}^{\infty} a_n$  converges then  $(a_n)$  converges to 0.
9. [T/F] A subsequence of  $(1, 1, 2, 3, 5, 6, 13, 21, 34, \dots)$  is  $(1, 2, 5, 13, 34, \dots)$ .
10. [T/F] A subsequence of  $(1, 1, 2, 3, 5, 6, 13, 21, 34, \dots)$  is  $(1, 2, 1, 5, 3, 13, 34, \dots)$ .
11. [T/F] A subsequence of  $(1, 1, 2, 3, 5, 6, 13, 21, 34, \dots)$  is  $(1, 1, 2, 2, 5, 5, 13, 13, 34, 34, \dots)$ .
12. [T/F] A subsequence of  $(1, 1, 2, 3, 5, 6, 13, 21, 34, \dots)$  is  $(1, 1, 2, 3, 5, 6, 13, 21, 34, \dots)$ .
13. [T/F] If  $(a_n)$  converges to  $a$ , then every subsequence of  $(a_n)$  converges to  $a$ .
14. [T/F] If some subsequence of  $(a_n)$  converges to  $a$ , then  $(a_n)$  converges to  $a$ .
15. [T/F] If every subsequence of  $(a_n)$  converges to  $a$ , then  $(a_n)$  converges to  $a$ .
16. [T/F] Every sequence of real numbers contains a convergent subsequence.
17. [T/F] Every monotone sequence of real numbers contains a convergent subsequence.
18. [T/F] Every bounded sequence of real numbers contains a convergent subsequence.