Math 199, Spring 2022
Yigal Kamel
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Preparation Assignment 7 - Sequences and series

Estimated Time: 30 minutes - 1 hour.

Goals: We are about shift gears into the second big topic of the course: sequences and series. We want to use this time to get our minds used to these new ideas.

1) Write down the definition of a(n) (infinite) sequence. How do you think about a sequence?

2) We are primarily interested in sequences whose terms get successively closer to some special point called the **limit** of the sequence. In this case, we say that the sequence **converges** to the limit. If there is no such special point, we say the sequence **diverges**. Try to write down a precise definition for what it means for a sequence $\{a_n\}_{n=1}^{\infty}$ to converge to the limit L.

3) Write down an example of a sequence that converges to 0.

We say a sequence $\{a_n\}_{n=1}^{\infty}$ is **bounded** if it's possible to find fixed numbers m and M, such that $m < a_n < M$ for every n.

4) Is it possible for an unbounded sequence to converge? If yes, give an example; if not, explain why not.

5) Is it possible for a bounded sequence to diverge? If yes, give an example; if not, explain why not.

6) Write down the definition of a(n) (infinite) series. How do you think about a series?

7) Explain why a series is just an example of a sequence. (Thus, we can apply the same notions of convergence and divergence.)

8) Write down an example of a series that converges. How do you know it converges?

9) If a sequence $\{a_n\}_{n=1}^{\infty}$ diverges, is it possible for the series $\sum_{n=1}^{\infty} a_n$ to converge? If yes, give an example; if not, explain why not.

10) If a sequence $\{a_n\}_{n=1}^{\infty}$ converges, is it possible for the series $\sum_{n=1}^{\infty} a_n$ to diverge? If yes, give an example; if not, explain why not.