Math 199, Spring 2022
Yigal Kamel
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Mock Exam 1 - Sequences and series

Estimated Time: 20 minutes.

1) True or False:

(a) If the series $\sum_{n=1}^{\infty} a_n$ converges, then the sequence of terms $\{a_n\}_{n=1}^{\infty}$ must converge to zero.

(b) If the sequence $\{a_n\}_{n=1}^{\infty}$ converges to zero then the series $\sum_{n=1}^{\infty} a_n$ must converge.

(c) If the sequence $\{a_n\}_{n=1}^{\infty}$ converges to zero, then the series $\sum_{n=1}^{\infty} a_n$ must converge.

(d) It is possible for the set of points x for which the series $\sum_{n=1}^{\infty} a_n x^n$ converges to be $(-\infty, 2) \cup (3, 4]$.

2) Calculate the 2022th derivative of the "sinc" function $\text{sinc}(x) = \dfrac{\sin x}{x}$ at $x = 0$.

3) Does the series $\sum_{n=1}^{\infty} \dfrac{n+3}{2n^2 - 4n + 1}$ converge absolutely, converge conditionally, or diverge? Explain exactly which tests you are using and why you can use them.