Math 199, Fall 2022
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Participation assignment 9 - Examples of series

Estimated time: Less than 1 hour.

Point value: 3 points.

Goals: Appreciate how series can help us capture the behavior of certain phenomena.

Disclaimer: We will work through these problems in steps together in class.

1) For which values of $p \in \mathbb{R}$ does the series $\sum_{n=1}^{\infty} \dfrac{1}{n^p}$ converge, and for which values does it diverge? Explain.

2) <u>The infinite block tower.</u> Suppose you have a large number of rectangular blocks of equal dimensions and equal (uniform) density. Your goal is to stack the blocks in a tower, one by one, so that the distance of the overhang (the length of the part of tower that does not have support on the ground) is maximized. Given unlimited blocks, how long can you make the overhang?
(Hint: consider center of mass)

3) <u>The Koch snowflake.</u> The Koch snowflake is an intricate shape that is built in successive stages. Stage 1 is starting with an equilateral triangle. Stage 2 is to replace the middle third of each side with the other two sides of an equilateral triangle of the same side-length. Each future stage is achieved by replacing the middle third of each straight line segment in the previous stage with the other two sides of an equilateral triangle of the same side-length.

(a) Set up a series that represents the perimeter of the Koch snowflake.

(b) Set up a series that represents the area inside the Koch snowflake.