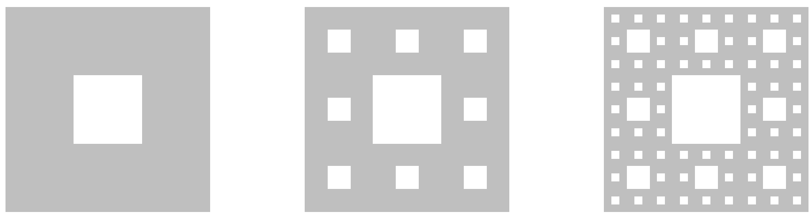
The following written homework problems are due at 6pm on Gradescope, the night before your next class, after the exam. You also have a WebWork assignment due at 11pm two days before your class.

(10.1) If the nth partial sum of a series $\sum_{n=1}^{\infty} a_n$ is $s_n = 3 - \frac{2}{(n+1)^2}$, find a_n and $\sum_{n=1}^{\infty} a_n$.

(10.2) Find the value of $\sum_{n=1}^{\infty} \frac{12}{(3n+1)(3n+4)}$ or explain why the series diverges.

(10.3) The **Sierpinski carpet** is a fractal constructed by removing the center one-ninth of a square of side length 1, then removing the centers of the eight smaller remaining squares, and so on, continuing this procedure indefinitely. The figure below shows the first three steps of this construction. Show that the sum of the areas of the removed squares is 1. This implies that the Sierpinski carpet has area 0!



(10.4) Professional Problem.

(a) If $\sum a_n$ is convergent and $\sum b_n$ is divergent, show that the series $\sum(a_n + b_n)$ is divergent.

(b) If $\sum a_n$ and $\sum b_n$ are both divergent, is $\sum(a_n + b_n)$ necessarily divergent? Prove this, or give a specific counterexample.

As always, refer to the "Professional Problem information" handout to create a *professionally written* solution. This week, you should especially focus on:

Methods: Try using "proof by contradiction" for part (a). In order to do this type of proof, you should assume the statement is false, and show that this leads to a contradiction. The idea is to show that it's impossible for the statement to be false.

The following sentences should be the beginning of your solution to part (a).

> We will prove this statement using proof by contradiction. Assume that there exist sequences $\{a_n\}$ and $\{b_n\}$ such that $\sum a_n$ is convergent and $\sum b_n$ is divergent, and the series $\sum(a_n + b_n)$ is convergent.

Organization & Structure: Focus on making your solution clear and concise. Most well-written solutions should fit onto a single page.

Notation & Terminology: Be careful about when you're referring to a sequence, and when you're referring to a series. In particular, writing "$\sum a_n$ converges" means something different than "a_n converges."

You should have questions!

When you do, here's what to do:

1. Post your question on Canvas.
2. Email *all* of the instructors with your question.
3. Write your solution (even if you're unsure about it) and bring it to the study session. Ask an instructor specific questions about it.

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