

Math 101 Homework

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Answer the following questions.

1. The primary use of measures is in integration. Recall from calculus that when we integrate a continuous function f on $[a, b]$, the integral is obtained as a limit of the form

$$\lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i) \left(\frac{b-a}{n} \right).$$

Note that the term $\frac{b-a}{n}$ is an interval length, so we could easily replace that term with a measure applied to smaller and smaller sets.

Why do you think this might be a useful idea? What kinds of functions do you think could be integrated in this new context of measure in place of length?

2. We proved in class that if we take a measurable coloring of the plane, it must use at least 5 colors. What does this suggest to you about $\chi(\mathbb{R}^2)$? Do you think measurable coloring is a good idea?