

## WRITING ASSIGNMENT 1, 18.100C

**Goal.** In order to do mathematics, we must first define our primary concepts. In this assignment, you will create several precise definitions of an ambiguous intuitive concept and then contrast your definitions by comparing their mathematical consequences.

**Assignment.** Create at least two precise definitions of the notion of a *gap* in an ordered set. Explain the qualitative differences between your definitions and examine several examples of ordered sets (*e.g.*,  $\mathbb{Z}$ ,  $\mathbb{R}$ ,  $(-\infty, 0] \cup (1, \infty)$ , *etc.*) illustrating the similarities and differences between your definitions. Provide rigorous proofs for the statements you make about your definitions and examples. One of your examples should be the set  $\mathbb{Q}$  of rational numbers (with its standard order); one of your definitions should identify  $\mathbb{Q}$  as having gaps, while another should identify  $\mathbb{Q}$  as gapless. You are invited to invent names for the properties you define, in which case you should try to make a good choice of terminology.

Your audience is a peer, such as an undergraduate student at MIT who has not taken and is not taking 18.100. Your writing should be clear, precise and unambiguous, but shouldn't be so technical that only someone taking 18.100 could follow it.

**Technical details.** Write your paper in  $\text{\LaTeX}$  and define and use appropriate theorem environments for your definitions and propositions. You should use the `amsart` document class with 11-point font. Do not alter the default margins. A good paper should be approximately two full pages long, and it is absolutely forbidden to exceed three pages. You are welcome to cite useful definitions or theorems from Rudin, in which case you should include a simple bibliography.

Submit your `.tex` file *and* a compiled `.pdf` file for both your draft and final version. Your grade will be based on clarity of exposition, mathematical correctness, and readability of  $\text{\LaTeX}$  in the final version of your paper. The assignment is worth 20 points.

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