

Writing Assignment 1: due by the start of class on Wednesday, October 1

Your first writing assignment is to write *careful* proofs for Exercises 8 and 12(a) (you don't need to do 12(b)) in Section 3.3 of your text. Hint for #12(a): use induction to show that, for any $n \in \mathbb{N}$, there are (at least) n rational numbers between x and y .

IMPORTANT NOTE. One of the things that separates “higher” math, like the math we’re learning in this class, from courses like Calculus is that, here, you’re expected not to just “know the math,” but to communicate it in a cogent (clear, logical, and convincing) way. To this end, in writing up your proofs, please follow the guidelines below. Failure to do so will affect your grade.

- Please SHOW ALL WORK.
- Feel free to work in groups to discuss these problems; your write-ups, however, should be completed individually, in your own words and ideas. If two or more submitted assignments look too similar, I will ask all parties to rewrite their work.
- The finished product should be neat, organized, and legible. If I can't read it, I can't grade it.
- Each solution should be written as though students in this course are the audience.
- Give all arguments completely; please don't use statements like “by an argument similar to the above.” (Proofs of some of the inequalities of Exercise 8 might look similar to others, but please give a full argument for each “ \leq .”)
- Answers should be written in complete sentences. (It's okay for complete sentences to contain mathematical symbols, equations, etc. For example, $x = 3$ is a complete sentence!!)
- It's not enough to just know what equations to write. A proof should read like a short essay. Please don't just throw down a bunch of equations and symbols. Preface and/or connect them with words like “assume,” “therefore,” “in addition,” “since,” or whatever is appropriate to the situation.
- Use symbols appropriately. For example, don't use “ \rightarrow ” if you mean “ $=$ ” or “ \Rightarrow .” If you don't know which symbol to use, use words instead.
- Please do not deviate from terminology or notation used in class notes or in the text, unless it's “plain English.”
- Make sure you explain where things “live.” For example, instead of “Since n is even, $n = 2k$,” write “Since n is even, we have $n = 2k$ for some $k \in \mathbb{Z}$.”
- Begin a proof with the word “Proof,” followed by stating all of the necessary assumptions.
- In an induction proof, do not refer to $A(n)$ before you've stated or described what $A(n)$ is. (Referring to $A(1)$ counts as referring to $A(n)$.)

- Don't start with $A(n+1)$ and "do math" to show that $A(n)$ follows. Remember that $P \Rightarrow Q$ is not the same as $Q \Rightarrow P$. So start with $A(n)$ and deduce $A(n+1)$.
- Please don't write things like

$$A(n) = 1 + 2 + \cdots + n = \frac{n(n+1)}{2}. \quad (*)$$

Instead, write

$$A(n) : 1 + 2 + \cdots + n = \frac{n(n+1)}{2}.$$

Or even better,

$$\text{Let } A(n) \text{ be the statement } 1 + 2 + \cdots + n = \frac{n(n+1)}{2}.$$

Why? Because in math, if you write $a = b = c$, then you're stating that a , b , and c are all equal. So if you write $(*)$, you're stating that $A(n) = 1 + 2 + \cdots + n$ and $A(n) = \frac{n(n+1)}{2}$. But $A(n)$ is not equal to either of these things. ($A(n)$ is a statement, while $1 + 2 + \cdots + n$ and $\frac{n(n+1)}{2}$ are mathematical quantities.)

- End a proof by summarizing what you've shown, and adding a "tag," like QED, or ATWMR, or \square . Feel free to use your own tag, but keep it appropriate and G-rated.
- Read your proof aloud to yourself, verbatim. If it doesn't sound like a clear, coherent argument, rewrite it.
- This assignment must be submitted either on paper, in class, before class begins, on the due date, or online through Canvas, before the start of class on the due date. If you are submitting handwritten work online, then you can submit either a scan, or photos, of this work. MAKE SURE YOUR SCANS/PHOTOS ARE CLEAR AND LEGIBLE, or you will lose points. If you have the technology and expertise to complete your assignments using a word processing program that is good with math symbols, then feel free to do so. But this is not necessary.