CS 70   Discrete Mathematics and Probability Theory
Spring 2025   Rao

HW 00

1 Administrivia

(a) Make sure you are on the course Ed (for Q&A) and Gradescope (for submitting homeworks, including this one). Find and familiarize yourself with the course website. What is its home-page's URL?

(b) Read the policies page on the course website.

  (i) What is the breakdown of how your grade is calculated, for both the homework and the no-homework option?

  (ii) What is the attendance policy for discussions?

 (iii) When are homeworks released and when are they due?

 (iv) How many "drops" do you get for homeworks? How many mini-vitamins will contribute to your grade?

  (v) When is the final exam?

   Note: the midterm date is still TBD, but once it is finalized, we will include it in an upcoming weekly post and on the course website.

 (vi) What percentage score is needed to earn full credit on a homework?

Solution:

(a) The course website is located at `https://www.eecs70.org/`.

(b) (i) For HW option: Discussion Attendance: 5%, Mini-vitamins: 5%, Homework: 15%, Midterm: 30%, Final: 45%.

   For no HW option: Discussion Attendance: 5%, Mini-vitamins: 5%, Midterm: 36%, Final: 54%.

  (ii) You will receive 1 attendance point for every discussion, and will need at least 13 points in order to receive full credit for discussion attendance. You are welcome to attend other discussion sections, and may receive credit for any section, though it is *strongly encouraged* that you consistently attend the discussion that you sign up for at the beginning of the semester.

 (iii) The homework for the current week is released on the course website on Sunday. The homework is due on Gradescope the following Saturday at 4:00 PM (grace period until 6:00 PM); the solutions for that homework will be released on Monday, a day after the release of the new homework.

2 Course Policies

Go to the course website and read the course policies carefully. Leave a followup on Ed if you have any questions. Are the following situations violations of course policy? Write "Yes" or "No", and a short explanation for each.

(a) Alice and Bob work on a problem in a study group. They write up a solution together and submit it, noting on their submissions that they wrote up their homework answers together.

(b) Carol goes to a homework party and listens to Dan describe his approach to a problem on the board, taking notes in the process. She writes up her homework submission from her notes, crediting Dan.

(c) Erin comes across a proof that is part of a homework problem while studying course material. She reads it and then, after she has understood it, writes her own solution using the same approach. She submits the homework with a citation to the website.

(d) Frank is having trouble with his homework and asks Grace for help. Grace lets Frank look at her written solution. Frank copies it onto his notebook and uses the copy to write and submit his homework, crediting Grace.

(e) Heidi has completed her homework using LaTeX. Her friend Irene has been working on a homework problem for hours, and asks Heidi for help. Heidi sends Irene her PDF solution, and Irene uses it to write her own solution with a citation to Heidi.

(f) Joe found homework solutions before they were officially released, and every time he got stuck, he looked at the solutions for a hint. He then cited the solutions as part of his submission.

Solution:

(a) Yes, this is a violation of course policy. All solutions must be written entirely by the student submitting the homework. Even if students collaborate, each student must write a unique, individual solution. In this case, both Alice and Bob would be culpable.

(b) No, this is not a violation of course policy. While sharing *written solutions* is not allowed, sharing *approaches* to problems is allowed and encouraged. Because Carol only copied down *notes*, not *Dan's solution*, and properly cited Dan's contribution, this is an actively encouraged form of collaboration.

(c) No, this is not a violation of course policy. Using external sources to help with homework problems, while less encouraged than peer collaboration, is fine as long as (i) the student

makes sure to understand the solution; (ii) the student uses understanding to write a new solution, and does not copy from the external source; and (iii) the student credits the external source. However, looking up a homework problem online is a violation of course policies; the correct course of action upon finding homework solutions online is to close the tab.

(d) Yes, this is a violation of course policy, and both Frank and Grace would be culpable. Even though Frank credits Grace, written solutions should never be shared in the first place, and certainly not copied down. This is to ensure that each student learns how to write and present clear and convincing arguments. To be safe, try not to let anybody see your written solutions at any point in the course—restrict your collaboration to *approaches* and *verbal communication*.

(e) Yes, this is a violation of course policy. Once again, a citation does not make up for the fact that written solutions should never be shared, in written or typed form. In this case, both Heidi and Irene would be culpable.

(f) Yes, this is a violation of course policy. Joe should not be reading solutions before they are officially released. Instead, Joe should ask for help when he is stuck through Ed or Office Hours.

3 Use of Ed

Ed is incredibly useful for Q&A in such a large-scale class. We will use Ed for all important announcements. You should check it frequently. We also highly encourage you to use Ed to ask questions and answer questions from your fellow students.

(a) Read the Ed Etiquette section of the course policies and explain what is wrong with the following hypothetical student question: "Can someone explain the proof of Theorem XYZ to me?" (Assume Theorem XYZ is a complicated concept.)

(b) When are the weekly posts released? Are they required reading?

(c) If you have a question or concern not directly related to the course content, where should you direct it?

Solution:

(a) There are two things wrong with this question. First, this question does not pass the 5-minute test. This concept takes longer than 5 minutes to explain, and therefore is better suited to Office Hours. Second, this question does not hone in on a particular concept with which the student is struggling. Questions on Ed should be narrow, and should include every step of reasoning that led up to the question. A better question in this case might be: "I understood every step of the proof of Theorem XYZ in Note 2, except for the very last step. I tried to reason it like this, but I didn't see how it yielded the result. Can someone explain where I went wrong?"

(b) The weekly posts are released every Monday. They're required reading.

(c) Please send an email to `sp25@eecs70.org`.

4   Academic Integrity

Please write or type out the following pledge in print, and sign it.

> I pledge to uphold the university's honor code: to act with honesty, integrity, and respect for others, including their work. By signing, I ensure that all written homework I submit will be in my own words, that I will acknowledge any collaboration or help received, and that I will neither give nor receive help on any examinations.

5   Propositional Practice

Note 1

In parts (a)–(b), convert the English sentences into propositional logic. In parts (c)–(d), convert the propositions into English. For parts (b) and (d), use the notation $a \mid b$ to denote the statement "a divides b", and use the notation $P(x)$ to denote the statement "x is a prime number".

(a) For every real number k, there is a unique real solution to $x^3 = k$.

(b) If p is a prime number, then for any two natural numbers a and b, if p doesn't divide a and p divides ab, then p divides b.

(c) $(\forall x, y \in \mathbb{R})[(xy = 0) \implies ((x = 0) \vee (y = 0))]$

(d) $\neg((\exists y \in \mathbb{N})[(\forall x \in \mathbb{N})[(x > y) \implies ((y \mid x) \vee P(x))]])$

Solution:

(a) The trickiest part of this problem is the word 'unique'. We can express the existence of a unique solution in propositional logic with two statements connected with an 'and': (1) A solution exists, and (2) Any two solutions have to be the same. Hence, we can rewrite this statement as "For every real number k, there exists a real number x such that $x^3 = k$ and for all reals y and z, if both $y^3 = k$ and $z^3 = k$, then $y = z$." This, in propositional logic, is below:

$$(\forall k \in \mathbb{R})\left[(\exists x \in \mathbb{R})(x^3 = k) \wedge (\forall y, z \in \mathbb{R})(((y^3 = k) \wedge (z^3 = k)) \implies (y = z))\right].$$

(b) This sentence can be written in propositional logic as

$$(\forall p \in \mathbb{N})[(P(p)) \implies ((\forall a, b \in \mathbb{N})[((p \mid ab) \wedge \neg(p \mid a)) \implies (p \mid b)])].$$

(c) If the product of two real numbers is 0, then one of them must be 0.

(d) There is no natural number that divides every composite number greater than it.