Aids Allowed: Your *own notes* taken during lectures and office hours,
the lecture *slides and recordings* (for all sections), and the *Course Notes* (textbook).

Submission Instructions

- Submit your work directly on **MarkUs**—even if you are late!
- You may type your answers or hand-write them *legibly*, on paper or using a tablet and stylus.
- You may write your answers directly on the question paper, or on another piece of paper/document.
- You may submit your answers as a single document or as multiple documents.
- You may name your file(s) any way you want (there is no "required file").
- You must submit your answers in PDF or as photos (JPEG/JPG/GIF/PNG/HEIC/HEIF).
  Other formats (e.g., Word documents, LaTeX source files) **are NOT accepted**—you must **export** or **compile** documents to PDF, and **convert** images into a supported format.

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2. [10 marks] Translations. Let P be the set of all people and C be the set of all courses, and suppose we define the following predicates:

- $Enrolled(s, c)$: "s is enrolled in course c", where $s \in P$ and $c \in C$.
- $Teaches(p, s)$: "p teaches s", where $p \in P$ and $s \in P$ ($Teaches(x, y)$ is *not* the same as $Teaches(y, x)$).

Translate each of the following statements into predicate logic. No explanation is necessary. *Do not define any of your own predicates or sets, and use only the quantifiers and propositional operators from class.* You may use $=$ and $\neq$ to compare whether two people or courses are the same.

(a) **[2 marks]** There is exactly one person who teaches everyone.

(b) **[2 marks]** Everyone who doesn't teach anybody is enrolled in a course.

(c) **[2 marks]** Some student takes every course.

(d) **[2 marks]** Everyone teaches themselves and at least one other person.

(e) **[2 marks]** There is a course with exactly two people enrolled.