**Test.**  Written exam over chapters 1–4 on Monday, 5 February 2024. All questions will come from the textbook (or closely related, i.e., reworded, broken down into parts, or simplified.)

**Reading.**  Read Chapter 4: "Properties of Regular Languages".

**Assignment.**  Do some small number of the following exercises.

- Section 4.1: Problems 10–26.

- Section 4.2: Problems 1–12.

- Section 4.3: Problems 1–9, 18**a**bcd**e**fg.

**Applications of the Pumping Lemma.**  Applications of the pumping lemma all have the same outer structure. To prevent opaque, confusing, and logically incorrect proofs, please use the *exact* wording as given in class. Illuminating diagrams at the crux of the proof are welcome. Indeed, all answers anywhere should come with explanations *communicating* the solution.

**Submission.**  Write up the solutions. You may use pen and paper, plain text, or LaTeX. Produce a PDF document, and submit it on Canvas by the due date before the end of the day.

The due date is for the completed problem set. You should read the material in advance, and start thinking and working on the problems in advance, so that you can ask questions in class.

Collaborating is encouraged; no individual grade for the homework will be used in determined the individual course grade (that's what the tests are for). Copying just wastes everyone's time; it is quality that is important not quantity. Copying is not practicing. Of course, some individual may require much more practice than others to achieve the same level of competency on the tests.

**Questions.**  If you have questions about how to do the problems, you are welcome to send me e-mail: `ryan@fit.edu`. Students may be called upon to share and explain their progress on the exercises during class.

**Assessment.**  Ultimately the written proofs, your choice of exercises, and your participation in answering and *asking* questions, will influence your course grade.

**Objectives.** At the conclusion of the chapter, the student should be able to the following.

1. (§4.1) Define what a closure properties is

2. (§4.1) Prove that regular languages are closed under union, complementation, and intersection

3. (§4.1) Prove that regular languages are closed under concatenation, star-closure, and reversal

4. (§4.1\*) Prove that regular languages are closed under homomorphism

5. (§4.1\*) Describe right quotient construction

6. (§4.2) Describe a membership algorithm for regular languages

7. (§4.2) Describe an algorithm to determine if a regular language is empty, finite, or infinite

8. (§4.2) Describe an algorithm to determine if two regular languages are equal

9. (§4.3) Apply the pumping lemma to show that a language is not regular