

**Office Hours:** (TA hours are in shared TA space)

Regan: Wed. 1:15–3pm, Thu. 1–2pm, Fri. 1:15–2:15pm

Dobler: Mon. 2–3pm, Tue. 10–11am.

Ekstrum: Mon. 12–12:50pm, Wed. 12–12:50pm.

Xian: Fridays 1–2pm and 3–4pm.

Ye: Tue. 5–6pm, Thu. 5–6pm.

### Reading:

Next week’s lectures will cover *NFAs* and *regular expressions* in tandem. The previous reading instructions are much the same except to go up through page 69—stopping before you read the sentence with “generalized nondeterministic finite automaton” (GNFA). Also read the parts about closure under regular operations that were previously said as “skim.”

**Homework**—part online and all *individual work*:

(1) Using *TopHat*, the “Worksheet” titled *HW1 Online Part*. There will be 10 questions, each worth 2 points, for 20 total.

The other two problems are to be submitted as PDFs using the *CSE Autograder* system. This appears to be straightforward from directions at:

<https://autograder.cse.buffalo.edu/courses/CSE396-s18/assessments/hw1>

Scans of handwritten sheets are fine provided they are *easily legible* and *do not have excessive file-size*.

(2) Text, chapter 0, exercises 0.7 and 0.8. As one “stream of ideas” problem it goes like this: First give examples of:

- (a) a relation that is reflexive and symmetric but not transitive;
- (b) a relation that is reflexive and transitive but not symmetric;
- (c) a relation that is symmetric and transitive but not reflexive.

Drawing the relations as (directed or undirected) graphs is fine; on (c) it may help to recall that a universal quantification over an empty domain defaults to **true**. Then problem 0.8 involves the undirected graph  $G = (V, E)$  with  $V = \{1, 2, 3, 4\}$  and

$$E = \{ \{1, 2\}, \{2, 3\}, \{1, 3\}, \{1, 4\}, \{2, 4\} \}.$$

The text asks: (d) draw the graph, (e) what are the degrees of each node? and (f) give a path from node 3 to node 4 in your drawing of  $G$ . To these I add: (g) is the edge relation transitive? and (h) if you think yes, say why; if you think not, say why and also say what you could add to the graph to make it transitive. (So there are 8 total parts, each worth 3 pts., for 24 pts. total)

(3) Design a deterministic finite automaton with alphabet  $\{0, 1\}$  that recognizes the language of positive binary integers that are multiples of 5. It is *your choice* whether to allow leading 0s in the numbers—you must state your choice clearly.

Then show how you would modify your machine if the digit 2 is added to the alphabet and numbers are base 3. Draw the new diagram. (15+9 = 24 pts., for 68 total on the problem set)