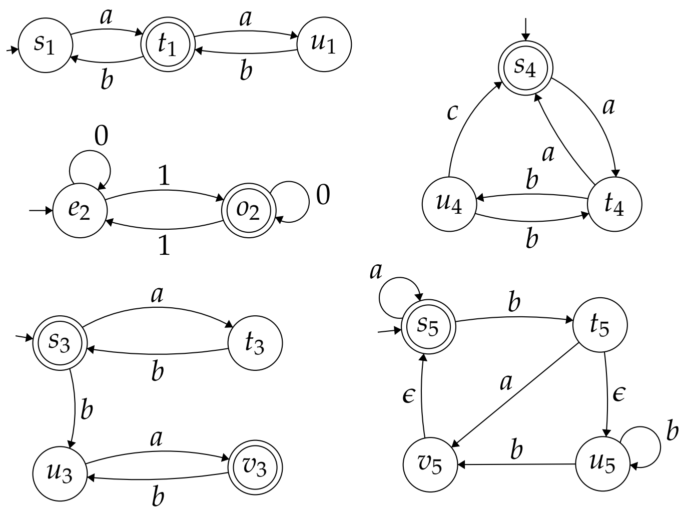
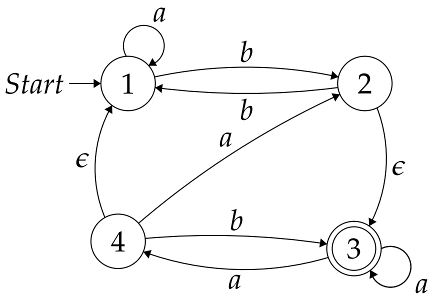
CSE396 Problem Set 3 Due 3/1, 11:59pm

Reading: Tuesday's lecture will give an example of the GNFA-to-regexp algorithm using both a "graphical" approach as in the text and "code-style" per my notes https://www.cse.buffalo.edu/~regan/cse396/CSE396.regexpalg in the "Extra Resources" section of the course webpage. Then read the notes at https://www.cse.buffalo.edu/~regan/cse396/CSE396MNT.pdf on the Myhill-Nerode Theorem. Last, read section 1.4 but use MNT in place of any application of the "Pumping Lemma"—my notes cover the first few examples and lectures will pick up from that.

(1) This problem is "HW3 Online Part" on *TopHat*, worth 20 pts. as before. Here are the five DFAs/NFAs for the first five short-answer questions on it, which will help cut down scrolling:



(2) Consider the following NFA N for this question and the next:



Convert N into a DFA M such that $L(M) = L(N)$ using the algorithm from the text and lecture notes. You must expressly use the algorithm and you must show the scratchwork used to derive your answer. *Then* use your DFA to help answer the following four questions:

(a) Can N process the string *baa* to any one of its four states? Trace out a computation of the DFA showing yes or no.

(b) Is there a string y such that N does **not** accept the string $baa \cdot y$? Again, demonstrate your answer using M and traces.

(c) Is there a string z that N cannot process?

(d) If the start state of N had been state 3 not state 1, then would the DFA have a dead state?

(In total this problem is worth $18 + 4 \times 3 = 30$ pts.)

(3) Convert N into a regular expression r such that $L(N) = L(r)$ using the algorithm from class. One reason why you'll want to use N not M is that it has only one accepting state different from the start state, so the shortcuts in lecture can be used, whereas M has quite a few accepting states. Again you must show your scratchwork and how you apply the algorithm. Once you get down to two states, it is OK to abbreviate your up-to-four regular expressions by "$\alpha, \beta, \gamma, \eta$" per my diagram in lecture notes (so long as you indicate clearly which is which) and just express your final answer in terms of those. Your scratchwork can be "graphical" or "code-style." (24 pts., for 74 total on the set)