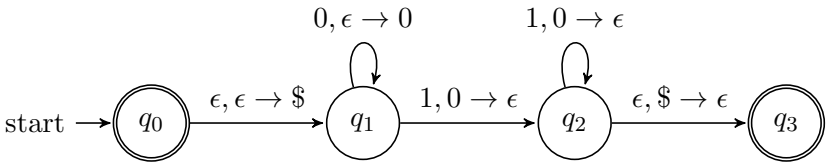
Homework 3–CSC 320 Summer 2018

Due by cinneX submission, Sunday, June 24, 11:55pm

1. (4) Convert the following CFG to a PDA using the construction given in class

$$S \to aAbS \mid bBaS \mid \epsilon$$
$$A \to aAbA \mid \epsilon$$
$$B \to bBaB \mid \epsilon$$

2. (4) Convert the following PDA to a CFG using the construction given in class



3. (4) A *TM with stay put instead of left* is similar to an ordinary TM, but the transition function has the form

$$\delta : Q \times \Gamma \to Q \times \Gamma \times \{R, S\}$$

At each step, the machine can move to the right or stay on the currently scanned square. Show that this TM model is *not* equivalent to the standard model. What class of languages does this model recognize?

4. (3) For each of the following operations, give a high-level explanation of why the decidable languages are closed under the operation

   (a) Concatenation

   (b) Intersection

   (c) Complement

5. (**Question moved to Problem Set 4** – you do not need to submit a solution to this problem.) (10) Give a high level description of an algorithm to show that

$$L_{nb} = \{\langle M \rangle \mid M \text{ when started on the blank tape, eventually writes a nonblank symbol}\}$$

is decidable. (HINT: If M has m states, how many moves will it take before you can tell?)