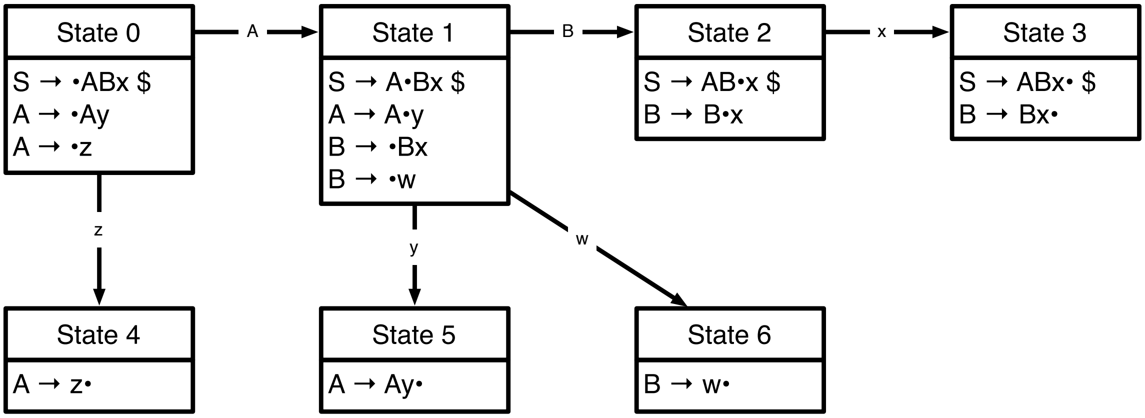
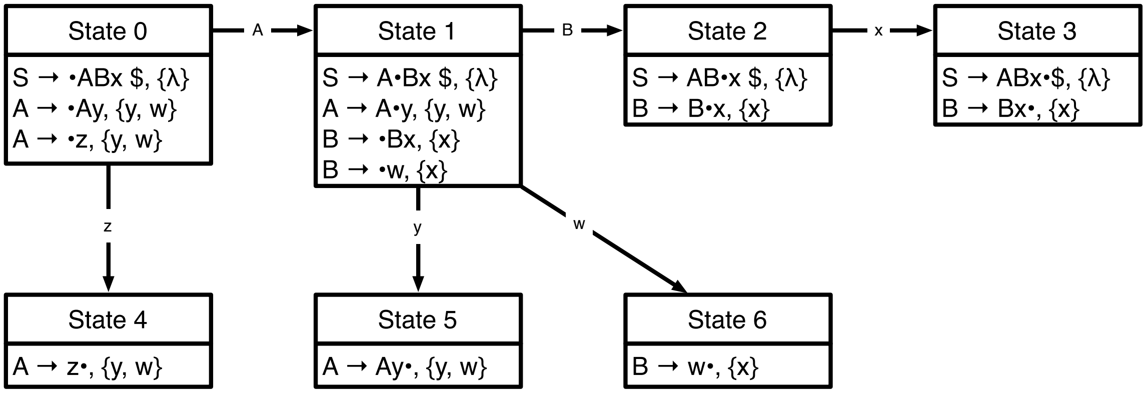
ECE 573
Problem Set 4: LR(1) parsers

1. The CSFM for this grammar is given below. This is not an LR(0) grammar, because in State 3 we do not know whether to shift (accept) or reduce.



2. The LR(1) machine for this grammar is given below. This is an LR(1) grammar because the shift/reduce conflict can be resolved with a single token of lookahead (*i.e.*, in State 3, we reduce if we see an x, shift if we see a $).



3. An LR(1) parser would take the following steps:

| **Step** | **Parse stack** | **Remaining input** | **Action** |
|---|---|---:|---|
| 1 | 0 | $zywxx$\$ | S/4 |
| 2 | 0 4 | $ywxx$\$ | R3, goto 1 |
| 3 | 0 1 | $ywxx$\$ | S/5 |
| 4 | 0 1 5 | $wxx$\$ | R2, goto 1 |
| 5 | 0 1 | $wxx$\$ | S/6 |
| 6 | 0 1 6 | $xx$\$ | R5, goto 2 |
| 7 | 0 1 2 | $xx$\$ | S/3 |
| 8 | 0 1 2 3 | $x$\$ | R4, goto 2 |
| 9 | 0 1 2 | $x$\$ | S/3 |
| 10 | 0 1 2 3 | \$ | Accept |

Note that we needed the lookahead to decide to reduce in step 8 (because the next token was an $x$) but to accept in step 10 (because the next token was a \$).