

Math 3342

HW #7

#1, 6c, 7, 12

#1

original:

|   | read       | pop | push       |
|---|------------|-----|------------|
| 1 | a          | S   | Sl         |
| 2 | $\epsilon$ | S   | $\epsilon$ |
| 3 | b          | l   | $\epsilon$ |

my change:

|   | read | pop | push       |
|---|------|-----|------------|
| 1 | a    | S   | Sl         |
| 2 | a    | S   | l          |
| 3 | b    | l   | $\epsilon$ |

Now we must begin by reading a,  
so  $\epsilon$  will not be accepted.

#6c

$\{x \in \{0,1\}^* \mid |x| \text{ is div. by } 3\}$

$S \rightarrow TTTS \mid \epsilon$

$T \rightarrow 0 \mid 1$

| read       | pop | push       |
|------------|-----|------------|
| $\epsilon$ | S   | TTTS       |
| $\epsilon$ | S   | $\epsilon$ |
| $\epsilon$ | T   | 0          |
| $\epsilon$ | T   | 1          |
| 0          | 0   | $\epsilon$ |
| 1          | 1   | $\epsilon$ |

#7

$$S \rightarrow S_1 | S_2$$

$$S_1 \rightarrow aS_1a | bS_1b | \varepsilon$$

$$S_2 \rightarrow XXS_2 | X$$

$$X \rightarrow a | b$$

| read          | pop   | push          |
|---------------|-------|---------------|
| $\varepsilon$ | $S$   | $S_1$         |
| $\varepsilon$ | $S$   | $S_2$         |
| $\varepsilon$ | $S_1$ | $aS_1a$       |
| $\varepsilon$ | $S_1$ | $bS_1b$       |
| $\varepsilon$ | $S_1$ | $\varepsilon$ |
| $\varepsilon$ | $S_2$ | $XXS_2$       |
| $\varepsilon$ | $S_2$ | $X$           |
| $\varepsilon$ | $X$   | $a$           |
| $\varepsilon$ | $X$   | $b$           |
| $a$           | $a$   | $\varepsilon$ |
| $b$           | $b$   | $\varepsilon$ |

derive  $bbb$

in grammar:  $S \rightarrow S_2 \rightarrow XXS_2 \rightarrow XXX \rightarrow bXX \rightarrow bbX \rightarrow bbb$

on stack:

$$(\varepsilon, S) \mapsto (bbb, S_2) \mapsto (bbb, XXS_2) \mapsto (bbb, bXS_2)$$

$$\mapsto (bb, XS_2) \mapsto (bb, bS_2) \mapsto (b, S_2) \mapsto (b, X)$$

$$\mapsto (b, b) \mapsto (\varepsilon, \varepsilon) \quad \checkmark$$

#12

$$S \rightarrow aOS | \varepsilon$$

$$O \rightarrow aOO | b$$

derive  $abab$ :

$$S \Rightarrow aOS \Rightarrow abS \Rightarrow ab aOS \Rightarrow ababS \Rightarrow abab$$