

Math 3342 HW #9

Chapter 13 # 7, 9, 12, 13

#7

read	pop	push
ϵ	S	S_1
ϵ	S	S_2
ϵ	S_1	aS_1a
ϵ	S_1	bS_1b
ϵ	S_1	ϵ
ϵ	S_2	XXS_2
ϵ	S_2	X
ϵ	X	a
ϵ	X	b
a	a	ϵ
b	b	ϵ

$$\begin{aligned}
 (abba, S) &\mapsto (abba, S_1) \mapsto (abba, aS_1a) \\
 &\mapsto (bba, S_1a) \mapsto (bba, bS_1ba) \\
 &\mapsto (ba, S_1ba) \mapsto (ba, ba) \\
 &\mapsto (a, a) \mapsto (\epsilon, \epsilon) \quad \checkmark
 \end{aligned}$$

$$\begin{aligned}
 (bbb, S) &\mapsto (bbb, S_2) \mapsto (bbb, XXS_2) \\
 &\mapsto (bbb, bXS_2) \mapsto (bb, XS_2) \\
 &\mapsto (bb, bS_2) \mapsto (b, S_2) \mapsto (b, X) \\
 &\mapsto (b, b) \mapsto (\epsilon, \epsilon).
 \end{aligned}$$

#9

read	pop	push
ϵ	S	$XS\Upsilon$
ϵ	S	ϵ
ϵ	X	a
ϵ	X	b
ϵ	Υ	c
ϵ	Υ	d
a	a	ϵ
b	b	ϵ
c	c	ϵ
d	d	ϵ

$$\begin{aligned}
 (abcd, S) &\mapsto (abcd, XS\Upsilon) \mapsto (abcd, aS\Upsilon) \\
 &\mapsto (bcd, S\Upsilon) \mapsto (bcd, XS\Upsilon\Upsilon) \\
 &\mapsto (bcd, bS\Upsilon\Upsilon) \mapsto (cd, S\Upsilon\Upsilon) \\
 &\mapsto (cd, \Upsilon\Upsilon) \mapsto (cd, c\Upsilon) \\
 &\mapsto (d, \Upsilon) \mapsto (d, d) \mapsto (\epsilon, \epsilon).
 \end{aligned}$$

#12

$$S \rightarrow aOS \mid \varepsilon$$

$$O \rightarrow aOO \mid b$$

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

#13

$$S \rightarrow aSa \mid bSb \mid \varepsilon$$