Exercise 2.

1. apply reverse operation

   a. ε. ϕ remain $R(a) \cup R(b) \Leftarrow \emptyset\, a \cup b$

               $(R(a))^*$. a^* ....

   In PFA/NFA reverse arrow

2. $(a^* a (b \cup \varepsilon))^*$ ~~$a^*(b\cup\varepsilon)$~~ 网上看到的: $(a^* ab)^*$

   从左至右画自动机即可

3. $a^p b^p a^p b^p$ (X)

   $0^p 1 1 0^p$

   $\Rightarrow xy$ only 0

   $\Rightarrow 0^{p-k}(0^k)^i 1 1 0^p$

   $\{ i=0. \quad 0^{p-k} 1 1 0^p \notin L$

4. $a^{p+1} b^p$ (X)

   $a^p b^{p-1}$

   $\Rightarrow xy$ only a

   $\Rightarrow a^{p-k}(a^k)^i b^{p-1}$

   $\Rightarrow \{ i=0. \quad p-k \geq p-1 与 i \geq j$ 矛盾.

5.

               a   a

state	input	stack	stack	state
q_0	a	z	az	(q_0)
q_0	a	a	aa	(q_0)
q_0	b	z	bz	q_0
q_0	b	b	bb	q_0
q_0	a	b	ab	q_0
q_0	b	a	ba	q_0
q_0	a	a	ε	q_1
q_0	b	b	ε	q_1
q_1	a	a	ε	q_1
q_1	b	b	ε	q_1
q_1	ε	z	accept	

$a.b \to ab$
$aa \to aa$
$ba \to ba$

$a.a \to \varepsilon$
$b.b \to \varepsilon$

$a.b \to ab$ $a.a \to \varepsilon$
$aa \to aa$ $b.b \to \varepsilon$
$ba \to ba$ $a.a \to \varepsilon$ $\varepsilon.z.z \to z$
q_0 $\xrightarrow{b.b \to \varepsilon}$ q_1 $\xrightarrow{}$ accept.
$az \to az$
$bz \to bz$
$bb \to bb$

6 比 5 简单. 抵消完栈内的 a 即可. 同上.