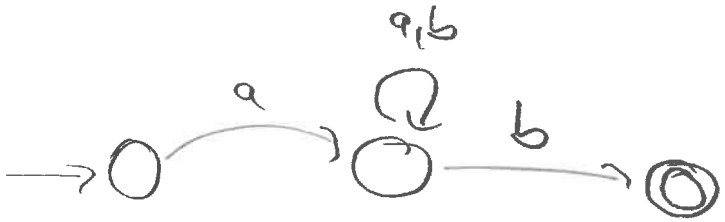
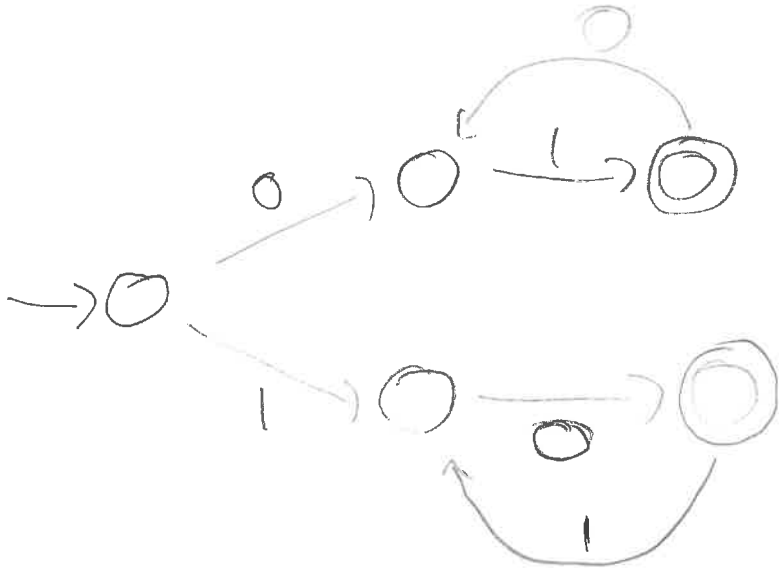
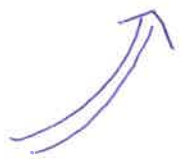
① 

② a) $01(01)^* + (10)^* 10$

b) 

(3) Abbreviate $q0$ by 0, $q1$ by 1 etc

states	a	b	not part of the answer
$\{0\}$	$\{0,1\}$	$\{0\}$	$\varepsilon + b + bb + bbb$
$\{0,1\}$	$\{0,1,2\}$	$\{0,2\}$	$a + ba + bba$
$\{0,1,2\}$	$\{0,1,2,3\}$	$\{0,2,3\}$	$aa + baa$
$\{0,2\}$	$\{0,1,3\}$	$\{0,3\}$	$ab + bab$
$\{0,1,2,3\}$	$\{0,1,2,3\}$	$\{0,2,3\}$	aaa
$\{0,2,3\}$	$\{0,1,3\}$	$\{0,3\}$	aab
$\{0,1,3\}$	$\{0,1,2\}$	$\{0,2\}$	aba
$\{0,3\}$	$\{0,1\}$	$\{0\}$	abb



This simplified way of recording the meaning of a state via the past does not work without modification for other automata