

# Introduction to the Theory of Computation

## Homework #5

Brian Gianforcaro

**1** Proof:

- Let  $L = \{a^i b^j | i \neq j\}$  is regular.
- $L$  is regular can not be the case.

□

**2** Let  $x$  and  $y$  be strings and let  $L$  be any language. We say that  $x$  and  $y$  are distinguishable by  $L$  if some string  $z$  exists whereby exactly one of the strings  $xz$  and  $yz$  is a member of  $L$ ; otherwise, for every string  $z$ , we have  $xz \in L$  whenever  $yz \in L$  and we say that  $x$  and  $y$  are indistinguishable by  $L$ . If  $x$  and  $y$  are indistinguishable by  $L$  we write  $x \equiv_L y$ . Show that  $\equiv_L$  is an equivalence relation.

**3**

**4** Minimize the DFA.

	1	2	3	4	5	6	7	8	9
1	-	-	-	-	-	-	-	-	-
2	$x_1$	-	-	-	-	-	-	-	-
3	$x_1$	$x_1$	-	-	-	-	-	-	-
4	$x_1$		$x_1$	-	-	-	-	-	-
5	$x_0$	$x_0$	$x_0$	$x_0$	-	-	-	-	-
6	$x_0$	$x_0$	$x_0$	$x_0$		-	-	-	-
7	$x_1$	$x_1$	$x_1$	$x_1$	$x_0$	$x_0$	-	-	-
8	$x_1$	$x_1$	$x_1$	$x_1$	$x_0$	$x_0$		-	-
9	$x_0$	$x_0$	$x_0$	$x_0$			$x_0$	$x_0$	-

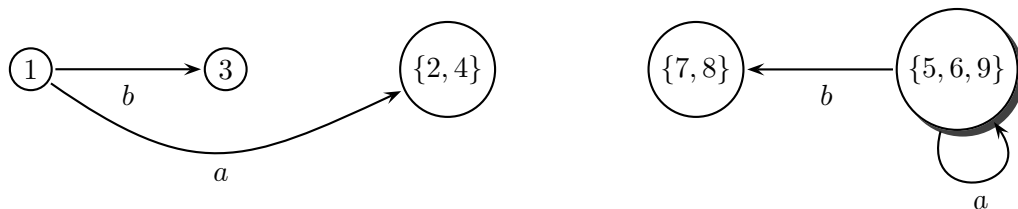


Figure 1: This is an example of a life-cycle diagram drawn using PSTricks

**5**

(a)

(b)

(c)

(d)

6 Sipser 2.4(b):  $\{w \mid w \text{ starts and ends with the same symbol}\}$

$R \rightarrow 0R \mid 1R \mid \epsilon$

$S \rightarrow 0 \mid 1 \mid 0R0 \mid 1R1$