1. 直接构造法构造这四个正则表达式的 DFA，并且最小化 DFA。

(a) (a|b)*

$(a|b)^*\#$
1 2 3

$followpos(1) = \{1,2,3\}$

$followpos(2) = \{1,2,3\}$

$followpos(3) = \{\}$

$S_0 = firstpos(root) = \{1,2,3\}$ —a→ $\{1,2,3\} = S_0$; —b→ $\{1,2,3\} = S_0$

(b) (a*|b*)*

$(a^*|b^*)^*\#$
1 2 3

$followpos(1) = \{1,2,3\}$

$followpos(2) = \{1,2,3\}$

$followpos(3) = \{\}$

$S_0 = firstpos(root) = \{1,2,3\}$ —a→ $\{1,2,3\} = S_0$; —b→ $\{1,2,3\} = S_0$

(c) ((ε|a)b*)*

$((\varepsilon|a)b^*)^*\#$

(position numbers: a = 1, b = 2, # = 3)

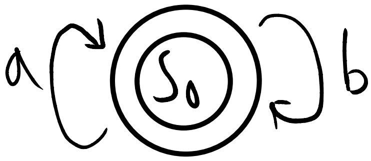
$followpos(1) = \{1, 2, 3\}$

$followpos(2) = \{1, 2, 3\}$

$followpos(3) = \{\}$

$S_0 = firstpos(root) = \{1, 2, 3\}$ $\xrightarrow{a}$ $\{1, 2, 3\} = S_0$

$S_0 = firstpos(root) = \{1, 2, 3\}$ $\xrightarrow{b}$ $\{1, 2, 3\} = S_0$



(d) (a|b)*abb(a|b)*

$(a|b)^*abb(a|b)^*\#$
$1\ 2\ \ 3\ 4\ 5\ \ 6\ 7\ \ 8$

followpos(1) = {1, 2, 3}
followpos(2) = {1, 2, 3}
followpos(3) = {4}
followpos(4) = {5}
followpos(5) = {6, 7, 8}
followpos(6) = {6, 7, 8}
followpos(7) = {6, 7, 8}
followpos(8) = {}

S_0 = startpos(root) = {1,2,3} —a→ {1,2,3,4} = S_1; —b→ {1,2,3} = S_0

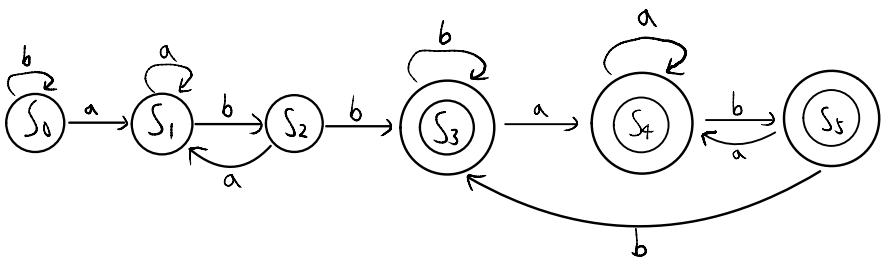
S_1 = {1,2,3,4} —a→ {1,2,3,4} = S_1; —b→ {1,2,3,5} = S_2

S_2 = {1,2,3,5} —a→ {1,2,3,4} = S_1; —b→ {1,2,3,6,7,8} = S_3

S_3 = {1,2,3,6,7,8} —a→ {1,2,3,4,6,7,8} = S_4; —b→ {1,2,3,6,7,8} = S_3

S_4 = {1,2,3,4,6,7,8} —a→ {1,2,3,4,6,7,8} = S_4; —b→ {1,2,3,5,6,7,8} = S_5

S_5 = {1,2,3,5,6,7,8} —a→ {1,2,3,4,6,7,8} = S_4; —b→ {1,2,3,6,7,8} = S_3



{0, 1, 2}

a	b
0→1	0→0
1→1	1→②
2→1	2→③

{3, 4, 5}

a	b
3→4	3→3
4→4	4→5
5→4	5→4