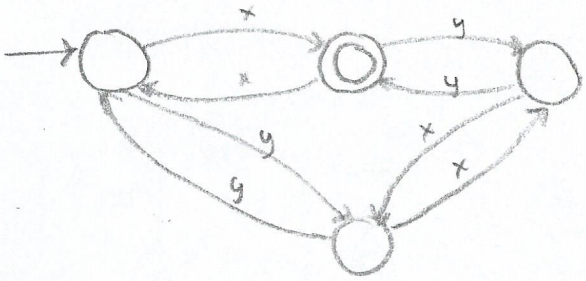
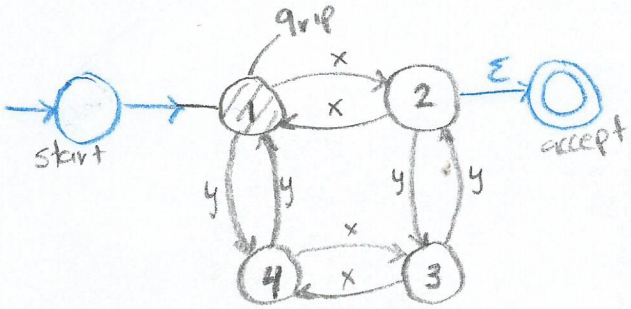
Tarea 1.5: Miguel Angel Soto Hernandez

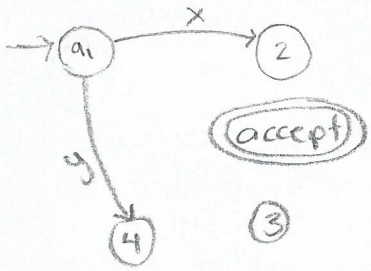
p.70 Write regular expressions that describe the following languages

16. b) All strings consisting of an odd number of xs and an even number of ys.



← DFA



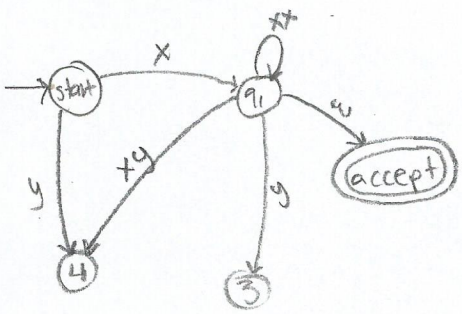


$q_1 - 2$	
$R_1: q_1 \to q_{rip}$	ε
$R_2: q_{rip}\,R$	—
$R_3: q_{rip} \to q_j$	x
$R_4: q_1 - q_j$	—

$q_1 - 3$	
$R_1: q_1 \to q_{rip}$	ε
$R_2: q_{rip}\,R$	—
$R_3: q_{rip} \to q_j$	—
$R_4: q_1 \to q_j$	—

$q_1 - accept$	
$R_1: q_1 \to q_{rip}$	ε
$R_2: q_{rip}R$	—
$R_3: q_{rip} \to q_j$	—
$R_4: q_1 \to q_j$	—

$q_1 - 4$	
$R_1: q_1 \to q_{rip}$	ε
$R_2: q_{rip}\,R$	—
$R_3: q_{rip} - q_j$	y
$R_4: q_1 - q_j$	—

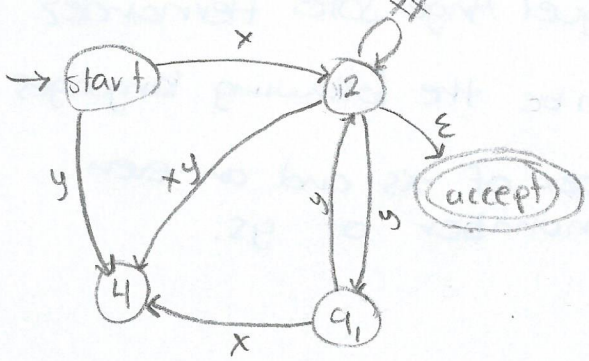


$q_1 = q_j$	
$R_1: q_1 \to q_{rip}$	x
$R_2: q_{rip}R$	—
$R_3: q_{rip} \to q_j$	x
$R_4: q_1 \to q_j$	—

$q_1 \to accept$	
$R_1: q_1 \to q_{rip}$	x
$R_2: q_{rip}R$	—
$R_3: q_{rip} \to q_j$	—
$R_4: q_1 \to q_j$	ε

$q_1 \to 3$	
$R_1: q_1 \to q_{rip}$	x
$R_2: q_{rip}R$	—
$R_3: q_{rip} \to q_j$	—
$R_4: q_1 \to q_j$	y

$q_1 \to 4$	
$R_1: q_1 \to q_{rip}$	x
$R_2: q_{rip}\,R$	—
$R_3 q_{rip} \to q_j$	y
$R_4: q_1 \to q_j$	—

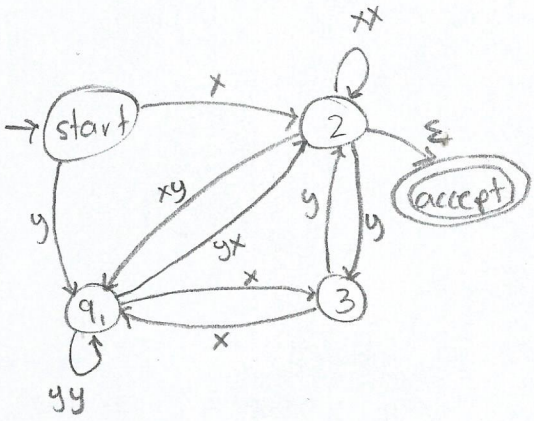


$q_1 = q_j$	
R1: $q_1 \to q_{rip}$	—
R2: q_{rip} ↻	—
R3: $q_{rip} \to q_j$	—
R4: $q_1 \to q_j$	—

$q_1 \to 2$	
R1: $q_1 \to q_{rip}$	—
R2: q_{rip} ↻	—
R3: $q_{rip} \to q_j$	x
R4: $q_1 \to q_j$	y

$q_1 \to 4$	
R1: $q_1 \to q_{rip}$	—
R2: q_{rip} ↻	—
R3: $q_{rip} \to q_j$	y
R4: $q_1 \to q_j$	x

$q_1 \to$ accept	
R1: $q_1 \to q_{rip}$	—
R2: q_{rip} ↻	—
R3: $q_{rip} \to q_j$	—
R4: $q_1 \to q_j$	—

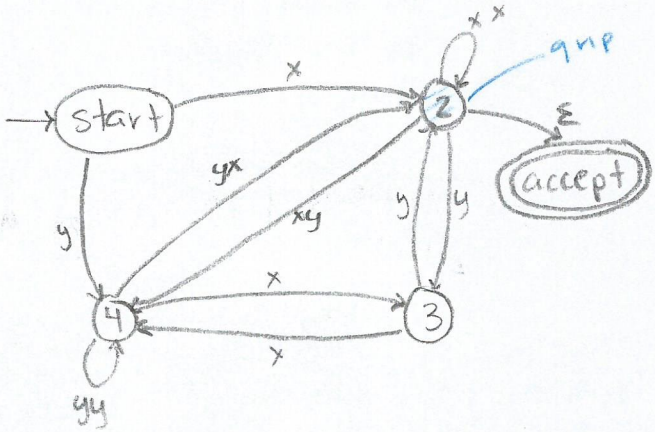


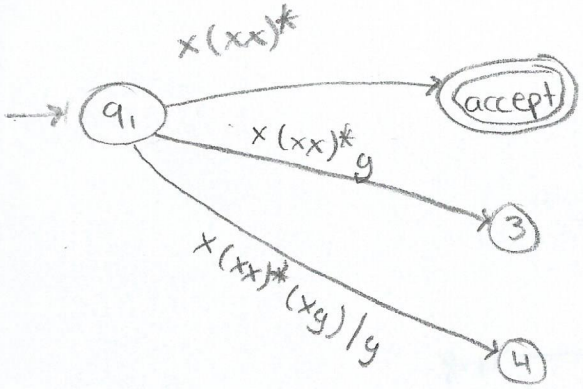
$q_1 = q_j$	
R1: $q_1 \to q_{rip}$	y
R2: q_{rip} ↻	—
R3: $q_{rip} \to q_j$	y
R4: $q_1 \to q_j$	—

$q_1 \to 2$	
R1: $q_1 \to q_{rip}$	y
R2: q_{rip} ↻	—
R3: $q_{rip} \to q_j$	x
R4: $q_1 \to q_j$	—

$q_1 \to 3$	
R1: $q_1 \to q_{rip}$	y
R2: q_{rip} ↻	—
R3: $q_{rip} \to q_j$	—
R4: $q_1 \to q_j$	x

$q_1 \to$ accept	
R1: $q_1 \to q_{rip}$	y
R2: q_{rip} ↻	—
R3: $q_{rip} \to q_j$	—
R4: $q_1 \to q_j$	—

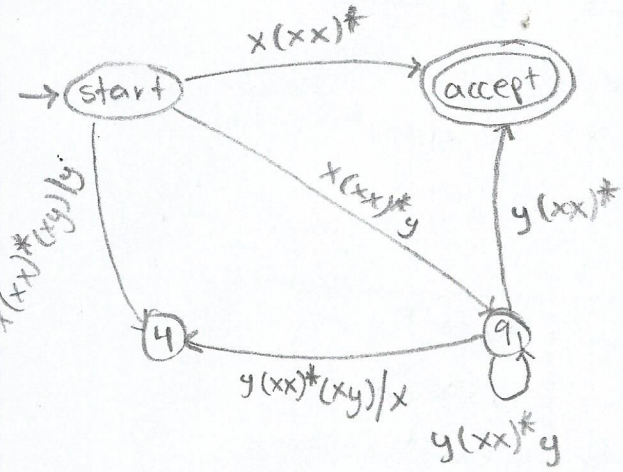




$q_1 \to$ accept	
$R_1: q_1 \to q_{rip}$	x
$R_2: q_{rip}$ ↻	xx
$R_3: q_{rip} \to q_j$	ε
$R_4: q_1 \to q_j$	$-$

$q_1 \to 3$	
$R_1: q_1 \to q_{rip}$	x
$R_2: q_{rip}$ ↻	xx
$R_3: q_{rip} \to q_j$	y
$R_4: q_1 \to q_j$	$-$

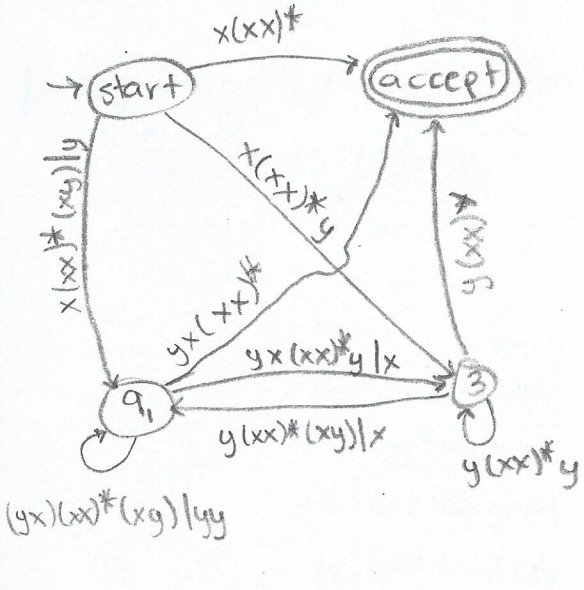
$q_1 \to 4$	
$R_1: q_1 \to q_{rip}$	x
$R_2: q_{rip}$ ↻	xx
$R_3: q_{rip} \to q_j$	xy
$R_4: q_1 \to q_j$	y



$q_1 = q_j$	
$R_1: q_1 \to q_{rip}$	y
$R_2: q_{rip}$ ↻	xx
$R_3: q_{rip} \to q_j$	y
$R_4: q_1 \to q_j$	$-$

$q_1 \to$ accept	
$R_1: q_1 \to q_{rip}$	y
$R_2: q_{rip}$ ↻	xx
$R_3: q_{rip} \to q_j$	ε
$R_4: q_1 \to q_j$	$-$

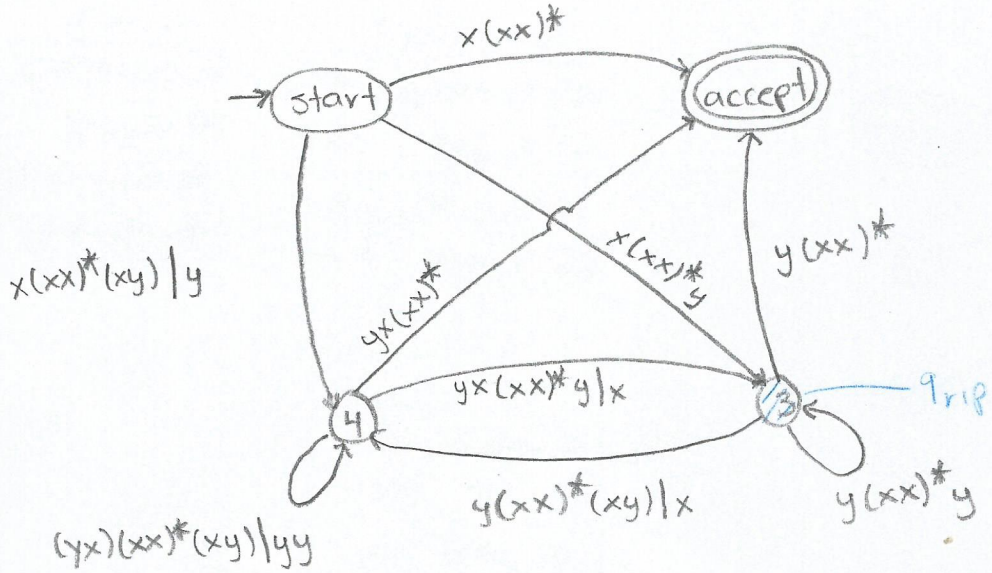
$q_1 \to 4$	
$R_1: q_1 \to q_{rip}$	y
$R_2: q_{rip}$ ↻	xx
$R_3: q_{rip} \to q_j$	xy
$R_4: q_i \to q_j$	x



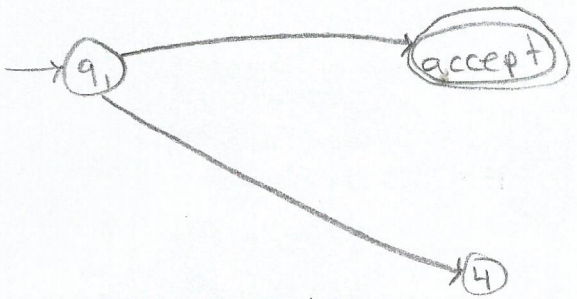
$q_1 = q_j$	
$R_1: q_1 \to q_{rip}$	yx
$R_2: q_{rip}$ ↻	xx
$R_3: q_{rip} \to q_j$	xy
$R_4: q_1 \to q_j$	yy

$q_1 \to$ accept	
$R_1: q_1 \to q_{rip}$	yx
$R_2: q_{rip}$ ↻	xx
$R_3: q_{rip} \to q_j$	ε
$R_4: q_i \to q_j$	$-$

$q_1 \to 3$	
$R_1: q_1 \to q_{rip}$	yx
$R_2: q_{rip}$ ↻	xx
$R_3: q_{rip} \to q_j$	y
$R_4: q_1 \to q_j$	x



$[(x(xx)^*y)(y(xx)^*y)^*(y(xx)^*) \mid x(xx)^*]$



$q_1 \rightarrow$ accept

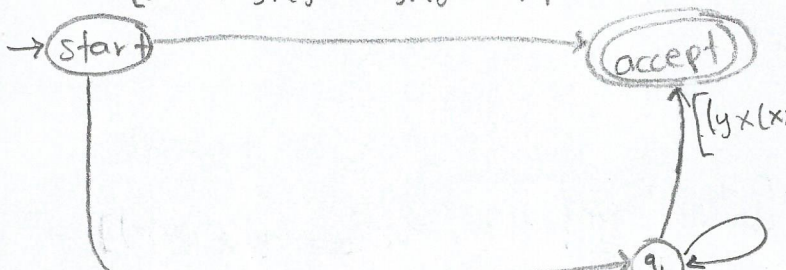
$R_1: q_1 \rightarrow q_{rip}$	$x(xx)^*y$
$R_2: q_{rip}$ ↻	$y(xx)^*y$
$R_3: q_{rip} \rightarrow q_j$	$y(xx)^*$
$R_4: q_1 \rightarrow q_j$	$x(xx)^*$

$[(x(xx)^*y)(y(xx)^*y)^*[y(xx)^*(xy)|x) \mid (x(xx)^*(xy)|y)]$

$q_1 \rightarrow 4$

$R_1: q_1 \rightarrow q_{rip}$	$x(xx)^*y$
$R_2: q_{rip}$ ↻	$y(xx)^*y$
$R_3: q_{rip} \rightarrow q_j$	$y(xx)^*(xy)\|x$
$R_4: q_1 \rightarrow q_j$	$x(xx)^*(xy)\|y$

$[(x(xx)^*y)(y(xx)^*y)^*(y(xx)^*) \mid x(xx)^*]$



$[(yx(xx)^*y|x)(y(xx)^*y)^*(y(xx)^*) \mid yx(xx)^*]$

$[(yx(xx)^*y|x)(y(xx)^*y)^*(y(xx)^*(xy)|x) \mid ((yx)(xx)^*(xy)|yy)]$

$[(x(xx)^*y)(y(xx)^*y)^*(y(xx)^*(xy)|x) \mid (x(xx)^*(xy)|y)]$

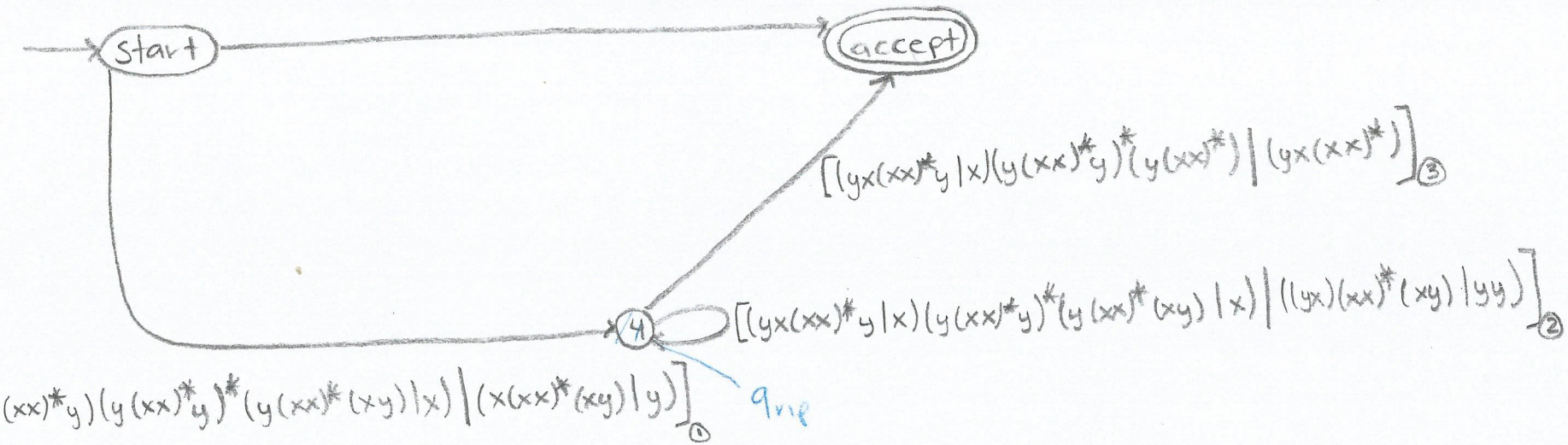
$q_1 \rightarrow$ accept

$R_1: q_1 \rightarrow q_{rip}$	$yx(xx)^*y\|x$
$R_2: q_{rip}$ ↻	$y(xx)^*y$
$R_3: q_{rip} \rightarrow q_j$	$y(xx)^*$
$R_4: q_1 \rightarrow q_j$	$yx(xx)^*$

$q_1 = q_j$

$R_1: q_1 \rightarrow q_{rip}$	$yx(xx)^*y\|x$
$R_2: q_{rip}$ ↻	$y(xx)^*y$
$R_3: q_{rip} \rightarrow q_j$	$y(xx)^*(xy)\|x$
$R_4: q_1 \rightarrow q_j$	$(yx)(xx)^*(xy)\|yy$

$[(x(xx)^*y)(y(xx)^*y)^*(y(xx)^*)\,|\,(x(xx)^*)]$ ④



$\Big[[(x(xx)^*y)(y(xx)^*y)^*(y(xx)^*(xy)\,|\,x)\,|\,(x(xx)^*(xy)\,|\,y)]$

$[(yx(xx)^*y\,|\,x)(y(xx)^*y)^*(y(xx)^*(xy)\,|\,x)\,|\,((yx)(xx)^*(xy)\,|\,yy)]^*$

$[(yx(xx)^*y\,|\,x)(y(xx)^*y)^*(y(xx)^*)\,|\,(yx(xx)^*)]$

$\Big|\,[(x(xx)^*y)(y(xx)^*y)^*(y(xx)^*)\,|\,(x(xx)^*)]\,\Big]$

$q_i \to$ accept

$R_1: q_i \to q_{rip}$	①
$R_2: q_{rip}R$	②
$R_3: q_{rip} \to q_j$	③
$R_4: q_i \to q_j$	④