Anthony Frazier
CSCE355
Assignment 4

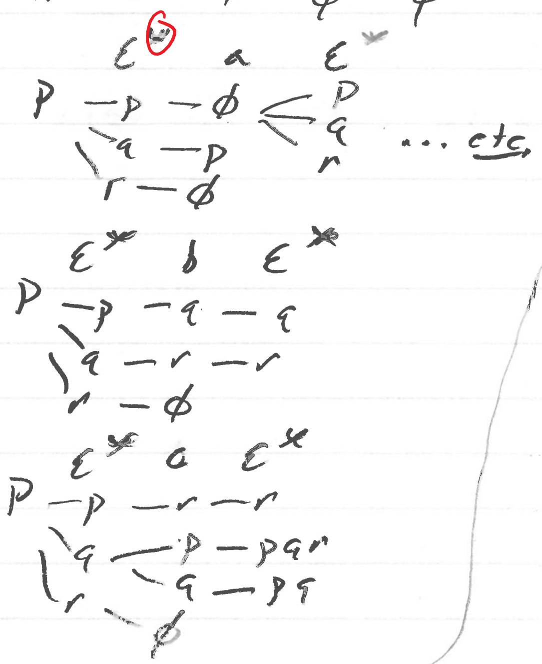
$\varepsilon^* = \varepsilon$

1) ε-NFA → NFA

	ε	a	b	c
→p	{q,r}	∅	{q}	{r}
q	∅	{p}	{r}	{p,q}
*r	∅	∅	∅	∅

→

	a	b	c
→p*	{p,q,r}	{q,r}	{p,q,r}
q	{p,q,r}	{r}	{p,q,r}
r*	∅	∅	∅



s=dead state

DFA for NFA

	a	b	c
→p*	pqr	qr	pqr
q	pqr	r	pqr
r*	s	s	s
qr*	pqr	r	pqr
c) pqr*	pqr	qr	pqr
s	s	s	s

εa, εac, εcε, εcc

b) a, ε, εb, bb, εcb, bcb, bcc, bac, baε, bcε,

2) Exercise 2.5.2

	ε	a	b	c
→p	{q,r}	∅	{q}	{r}
q	∅	{p}	{r}	{p,q}
r	∅	∅	∅	∅

a) Compute ε-closure

p: {p,q,r}
q: {q}
r: {r}

c)

	a	b	c
→p*	pqr	qr	pqr
~~q~~	~~pqr~~	~~r~~	~~pqr~~
r*	s	s	s
qr*	pqrs	rs	pqrs
pqr*	pqrs	qrs	pqrs
s	s	s	s
~~rs*~~	~~s~~	~~s~~	~~s~~
~~pqrs*~~	~~pqrs~~	~~qrs~~	~~pqrs~~
~~qrs*~~	~~pqrs~~	~~rs~~	~~pqrs~~

s=dead state

Use lazy subset constr, some of these are unreachable

If s is the dead state, then $pqr \cong pqrs$

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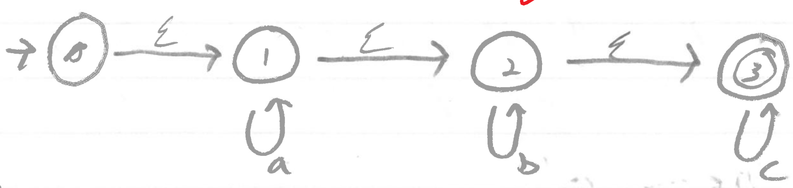
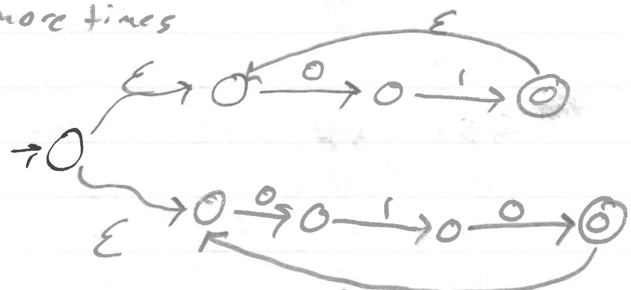
3) ε-NFA for: accepts $\emptyset \to \infty$ a's, followed by $\emptyset \to \infty$ b's, followed by $\emptyset \to$ c's,



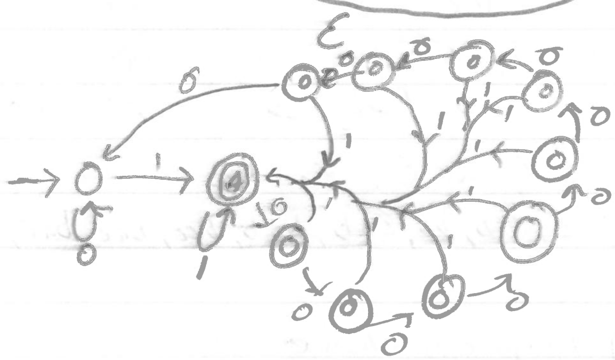
// wouldn't this accept cba?

but $\hat{\delta}(3,b) = \emptyset$

4) b) ε-NFA for: 01 repeated one or more times OR 010 repeated one or more times

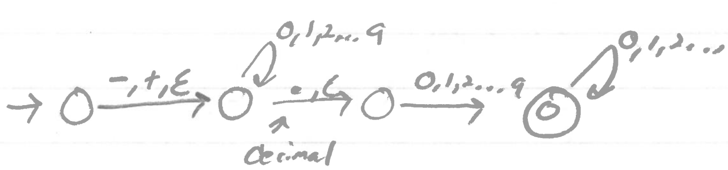


c)



//all 1s go back to A

7) $\Sigma = \{ . + - 0\ 1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 9 \}$



8) regex:

b) set of 0s and 1s whose tenth symbol from the right end is 1

$(0+1)^* 1 \underbrace{\overbrace{(0+1)(0+1)\ldots(0+1)}^{9 \text{ times}}}$

Write as $(0+1)^9$

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Try DFA → ¬DFA → regex

a) 3.1.3 a) set of all 0s and 1s not containing 101 as a substring

~~$(0^*1^*0^*) + (0^*1^*000^*1^*0^*)$~~ doesn't match 100100

10) 3.1.4 c) $(0+10)^*1^*$

the set of all strings over the alphabet 0, 1 containing zero or more combinations of 0 or 10, followed by zero or more repeating 1's. yes, but more succinctly:

set of all strings where no two ones are contiguous (unless as a suffix)

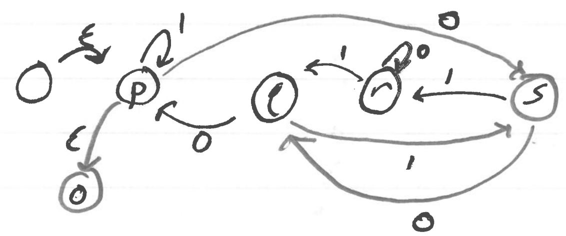
11) regex over {a, b, c} no a appears after any b or c.

$a^*(b+c)^*$ ✓

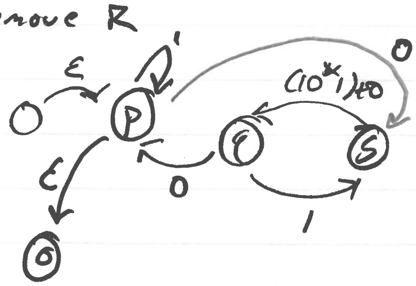
12) Convert DFA → regex

	0	1
→*p	s	p
q	p	s
r	r	q
s	q	r

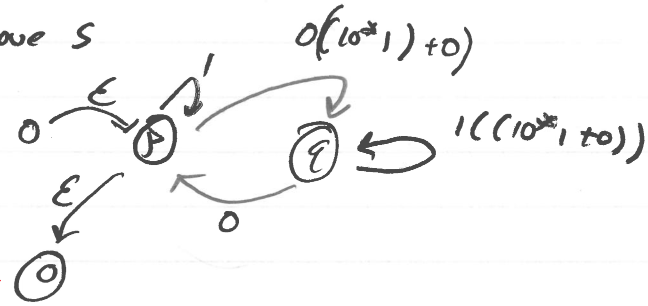
⟹



remove R



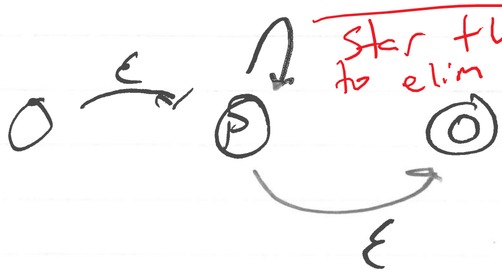
remove S



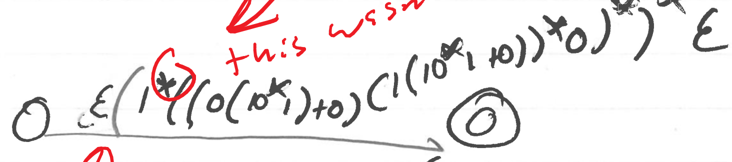
remove Q

$1+((0(10^*1)+0)(1(10^*1+0))^*0)^*$

star this whole expr to elim P.



remove P



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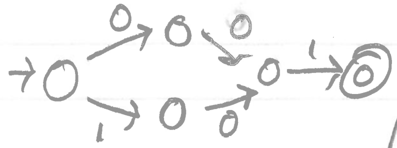
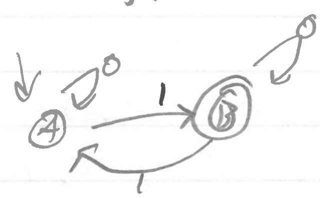
13) 3.2.4 b) $(0+1)01$



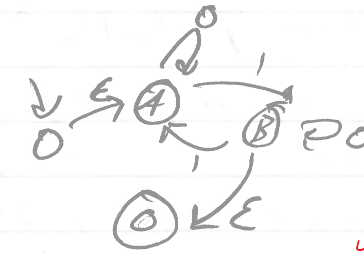
14)

	0	1
$\rightarrow A$	A	B
$*B$	B	A

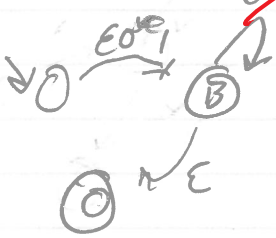
a) clean up:



b) regex:

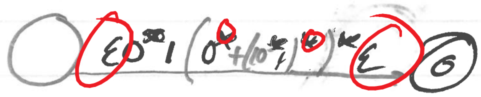


remove A



~~$0^*(10^*1)^*$~~ $0+10^*1$

remove B



drop ε

For any regex R

$\varepsilon R = R\varepsilon = R$