GPSI & HWI available

Last Time:
strings
languages
ops on languages:
- union, intersection, complement
- Concatenation
Liz= {xy: x.e.L., ye.Lz}
- Kleene star

$$L^{\pm} = \bigcup_{i=0}^{\infty} L^{i}$$

Regular Languages
all langs obtainable from union, concet, star
(starting from trivial base cases)
Formal Def's by induction
(i) \$\overline{s}, {a} are regular langs yae \$\mathcal{Z}\$
(ii) if L, Lz are regular langs,
fhen so are LiuLz, Liz, and L[#]
(only langs obtained by finite # applies of (i),(ii)
 $\overline{\Sigma} = \{0,1\}$
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b) {
$$1001, 10, 1$$
} is regular
= {1}.{0}.{0}.{1} U {1}.{0} U {1}.

c) all finite langs are regular.
d)
$$\{x \in \{0, 1\}^{*} : |x| \text{ is add}\}\$$
 is regular
 $= \{00, 01, 10, 11\}^{*} \cdot \{0, 1\}$
 $= (\{0\} \cup \{1\}) \cdot (\{0\} \cup \{1\}))^{*} \cdot \{0, 1\}$
:

Notation regular expressions
(i)
$$\phi$$
, ε , a are regular expr for ϕ , $\{\varepsilon\}$, $\{a\}$
base ε
(ii) if r_1, r_2 are regular exprs for L_1, L_2 resp.
then $(r_1 + r_2)$ is regress for L_1, L_2 resp.
then $(r_1 + r_2)$ is regressed for L_1, L_2 resp.
(r_1^{t}) '' L_1^{t}
(r_1^{t}) ''

(x)
$$(\xi = \{0,1\})$$

a) all strings with 00 as a substring
(a) all strings with 00 as a substring
(a) all strings with 00 as a substring
(i) part before 00: even = add
(ii) part after 00: even = add
(iii) part after 00: add
((ott)(ot1))* oo ((ott)(ot1))*
((ott)(ot1))* oo ((ott)(ot1))*(ott))
((ott)(ot1))* (ot1) oo ((ott)(ot1))*(ott))
((t) of * 01*)* + 1*
or ((* 0(* 0)*)*
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$$I(0+1)^{*} + 0I(0+1)^{*} + \varepsilon + 0$$

$$= (1+01)(0+1)^{*} + \varepsilon + 0$$
e) all strings not containing 00 as a substring
$$(1+01)^{*}(\varepsilon + 0) + (1+01)^{*}(\varepsilon + 0)$$

$$I(1+01)^{*}(\varepsilon + 0) + (1+01)^{*}(\varepsilon + 0)$$

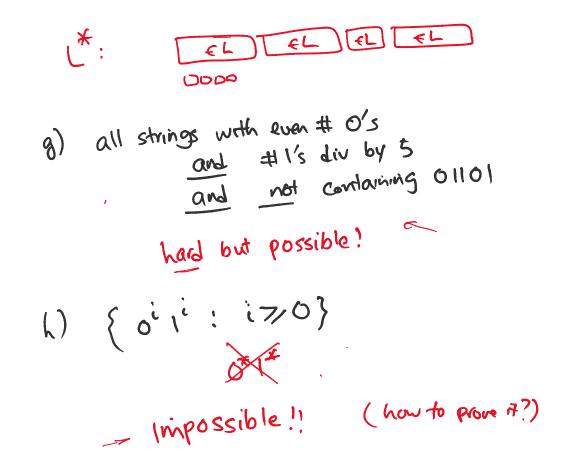
$$I(1+01)^{*}(\varepsilon + 0) + (1+0)^{*}(\varepsilon + 0)$$

$$I(1+0)^{*}(\varepsilon + 0) + (1+0)^{*}(\varepsilon + 0)$$

1

 $((00+11)^{*}(01+10)(00+11)^{*}(01+10))^{*}(00+11)^{*}$

01



Some identities

$$L((r_1+r_2)\cdot r_3) = L(r_1r_3+r_2r_3)$$

$$L((r^*)^*) = L(r^*)$$

$$L((r^*)^*) = L(r(sr)^*)$$

$$L((r+s)^*) = L((r^*+s^*)^*)$$

$$= L((r^*s^*)^*)$$

$$don't memorize!$$