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Automata Formal Languages & Logic

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Unit 2

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Two regular expressions(R_1 and R_2)are equivalent($R_1 = R_2$) iff:

$$L(R_1) = L(R_2)$$

We can determine the equivalence using:

1) A Formal method
2) An Informal method:

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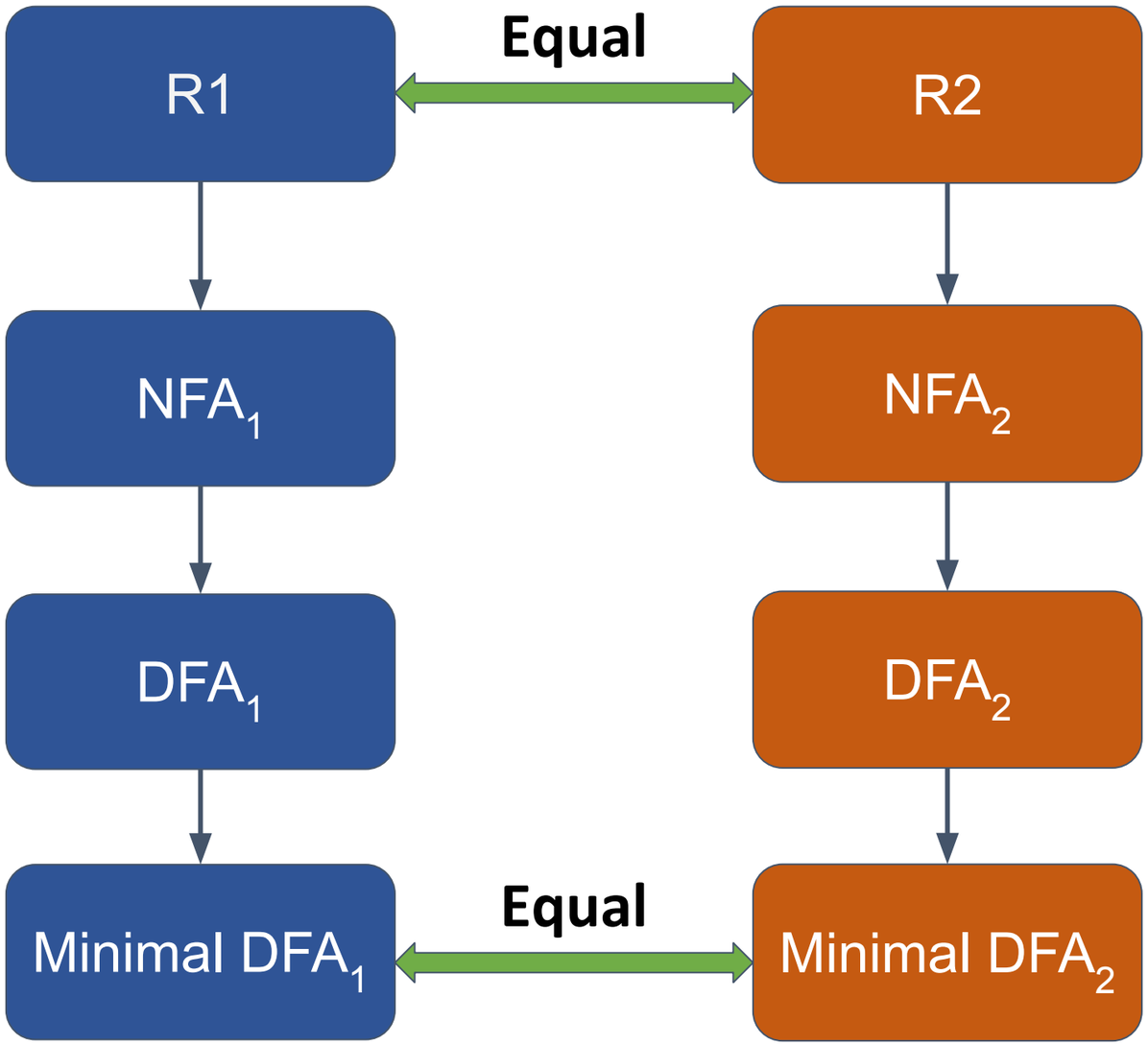
Formal method to prove Equivalence of two Regex



Informal Method -

We try proving $R_1 \neq R_2$

- Find a string that can be matched with only one of the regex hence proving that the two regex are not equivalent.
- Faster
- But, based on hit and trail.
- Can only be used to prove inequality!!

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Let us look at examples and find out whether two regex are equivalent or not??

Example 1:

(0+1)*(0+λ)

(1+λ)(1+0)*

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Formal Method

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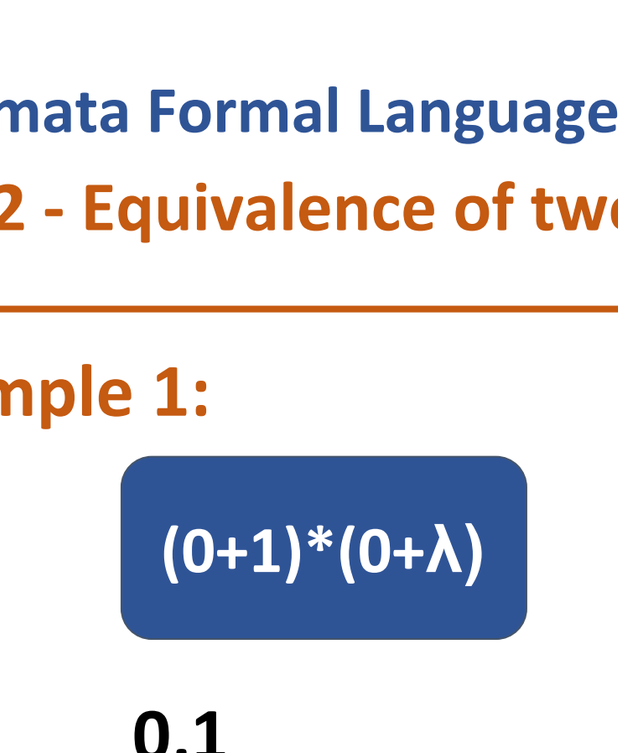
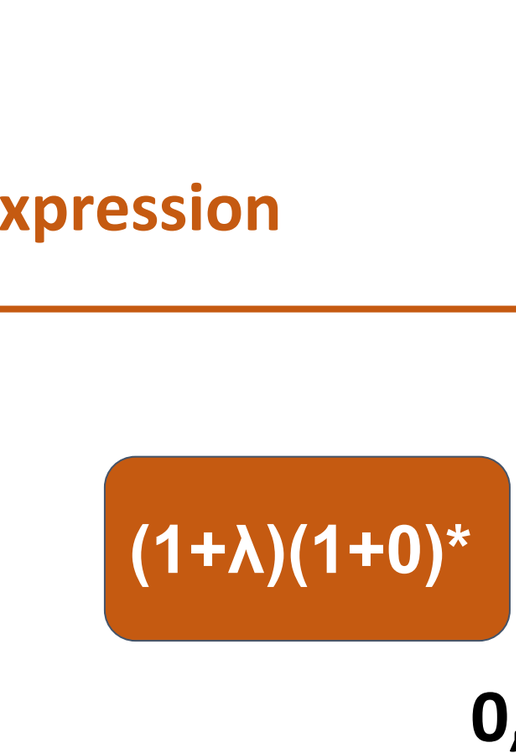
NFA





Example 1:

Formal Method

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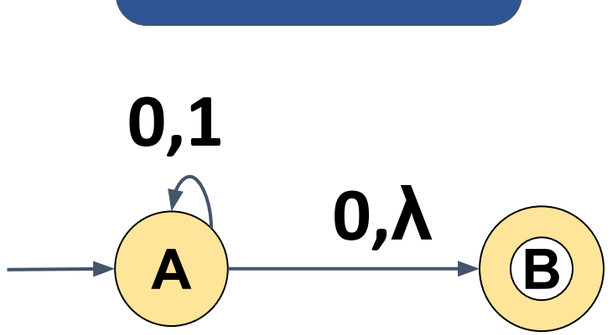
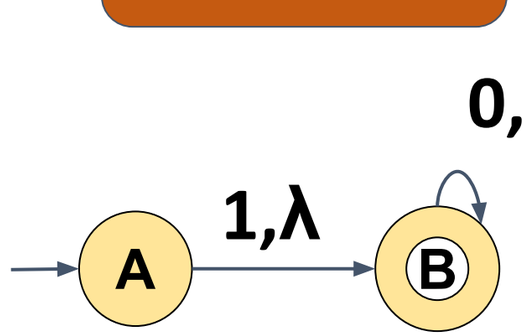
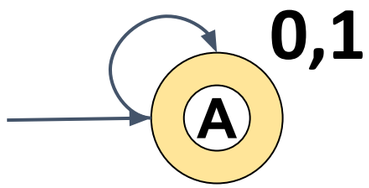
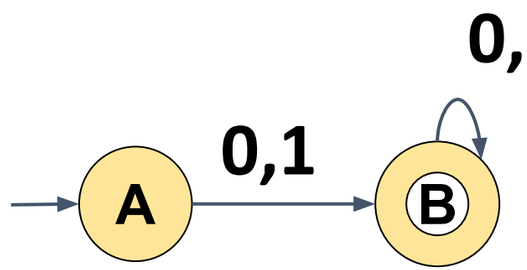




DFA





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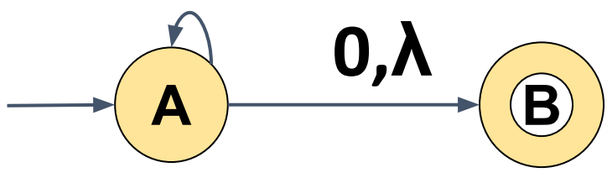
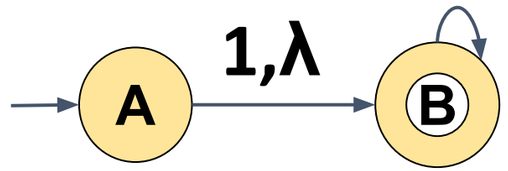
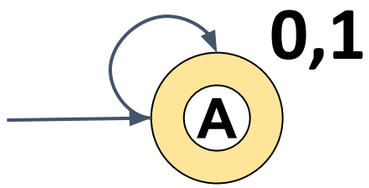
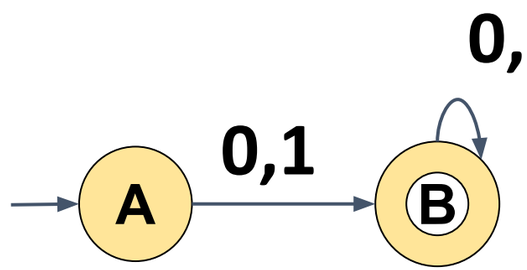


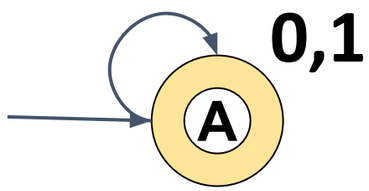


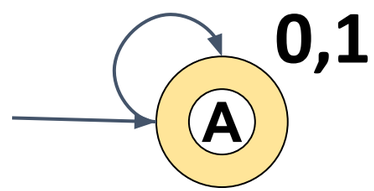
DFA





Minimal DFA





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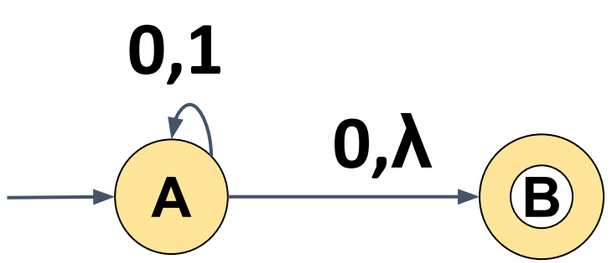
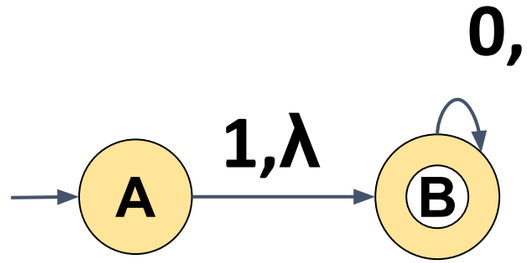
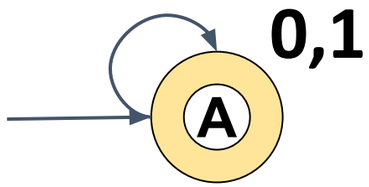
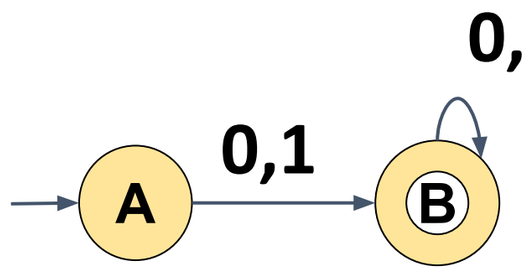




DFA





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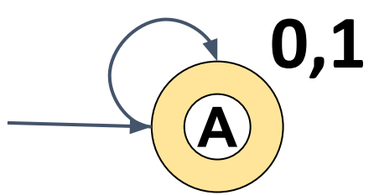
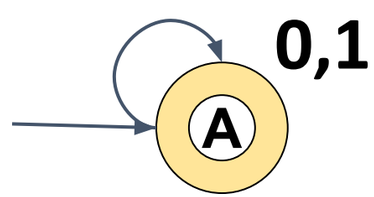
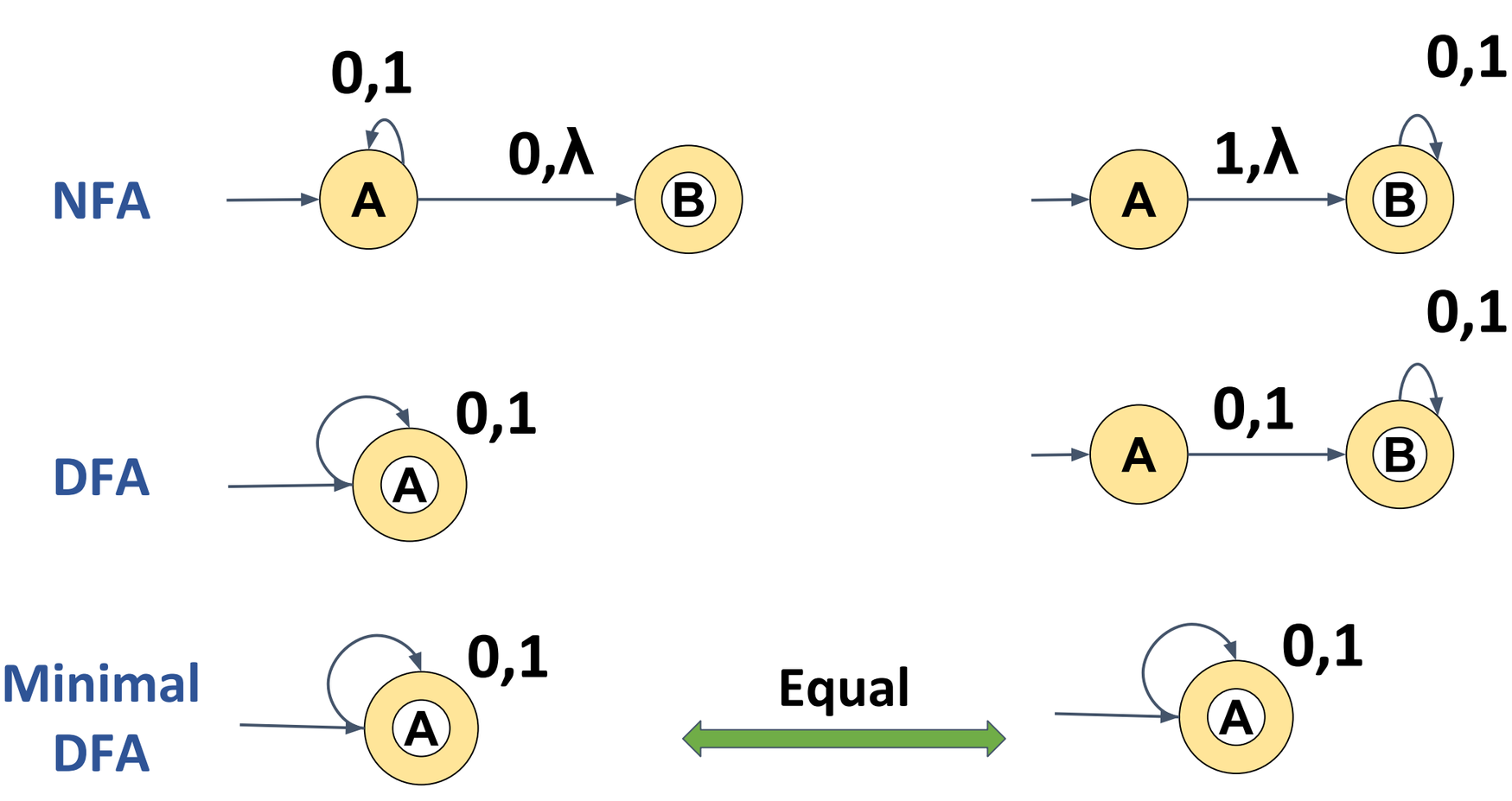


Equal



Example 11:

Formal Method



Example 2:

$(0+\lambda)(11^*0)^*(1+\lambda)$

$(1+\lambda)(011^*)(0+\lambda)$

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Informal Method

(1+λ)(011*)(0+λ)

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Find a string belongs to only one of the regex

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Example 2:

(0+λ)(11*0)*(1+λ)

Informal Method

(1+λ)(011*)(0+λ)

Find a string belongs to only one of the regex

(1+λ)(011*)(0+λ)

011

Example 2:

(0+λ)(11*0)*(1+λ)

Informal Method

(1+λ)(011*)(0+λ)

Find a string belongs to only one of the regex

(0+λ)(11*0)*(1+λ)

(1+λ)(011*)(0+λ)

011

Example 2:

Informal Method

$(0+\lambda)(11^*0)^*(1+\lambda)$

$(1+\lambda)(011^*)(0+\lambda)$

Find a string belongs to only one of the regex

$(0+\lambda)(11^*0)^*(1+\lambda)$

011 cannot be generated

$(1+\lambda)(011^*)(0+\lambda)$

011

Example 2 Informal Method

(0+λ)(11*0)*(1+λ) ≠ (1+λ)(011*)(0+λ)

Find a string belongs to only one of the regex

(0+λ)(11*0)*(1+λ)

011 cannot be generated

(1+λ)(011*)(0+λ)

011

Can you answer whether the two regex are equivalent or not??

1) $(1+\lambda)\ (00^*1)^*\ 0^*$ and $(0+\lambda)\ (11^*0)1^*$

2) $0^*(10^*)^*$ and $(1^*0)^*1^*$

THANK YOU

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