

a ranked alphabet

arity 2



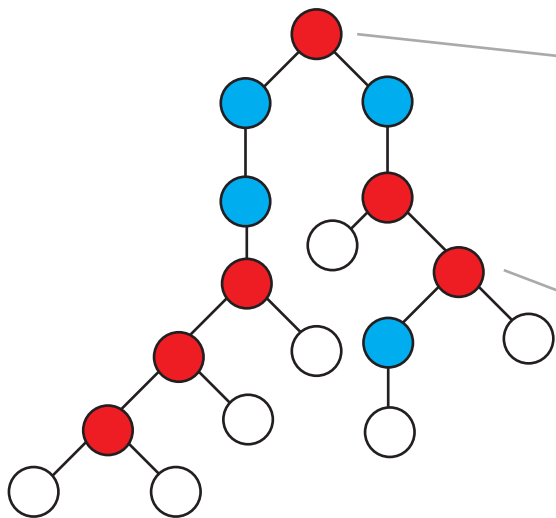
arity 1



arity 0



a tree



this node has a label of arity 2,  
and therefore it has 2 children

this node is child 2  
(children are ordered)



A tree  $t$  over  $\Sigma^{[2]}$



$\text{unfold}_1(t)$



$\text{unfold}_2(t)$





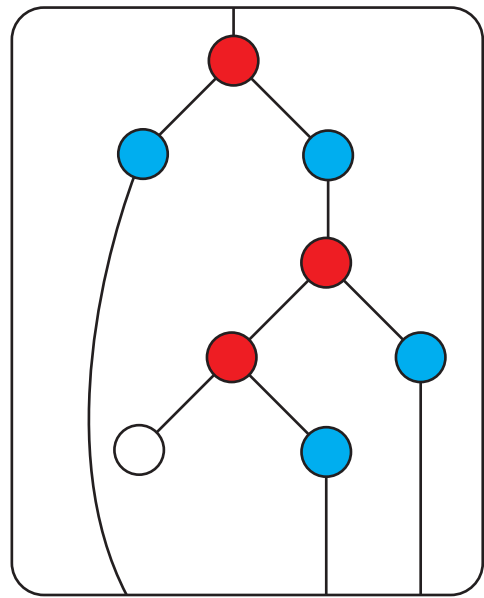
$t$



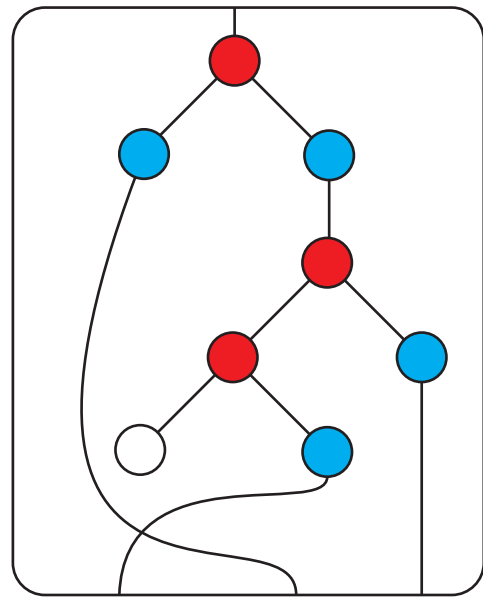
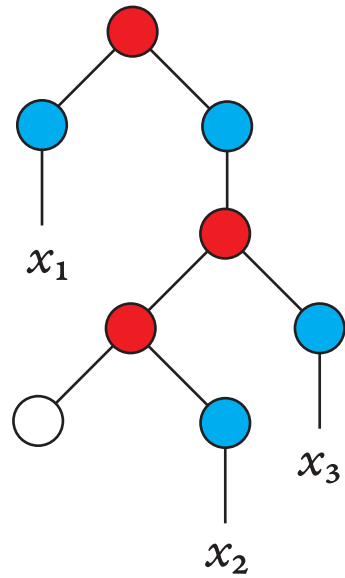
substitute( $t$ )



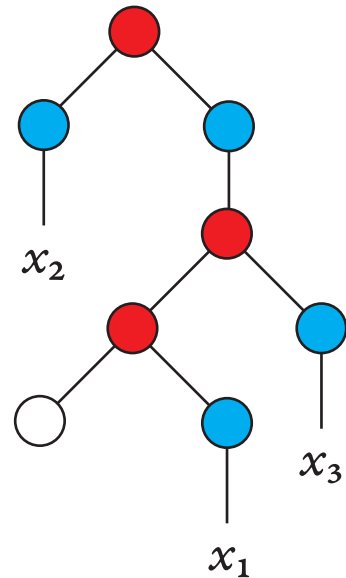


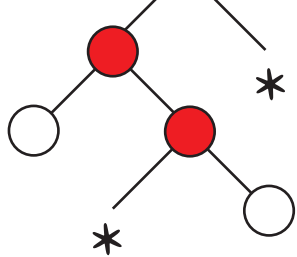


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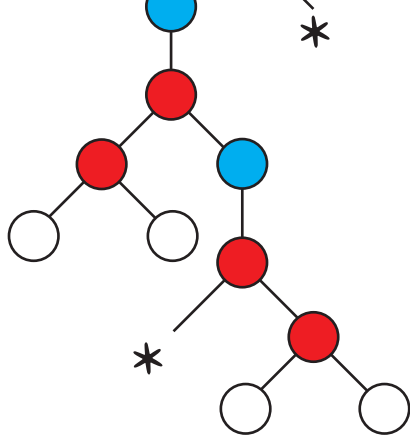


=





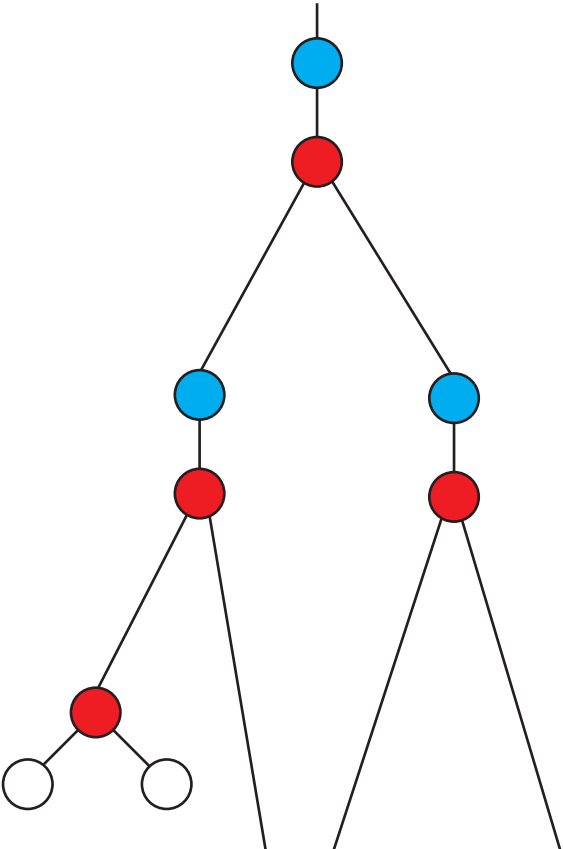
$\mathsf{T}f$   
 $\mapsto$







$\mapsto$





a term



ancestor equivalence

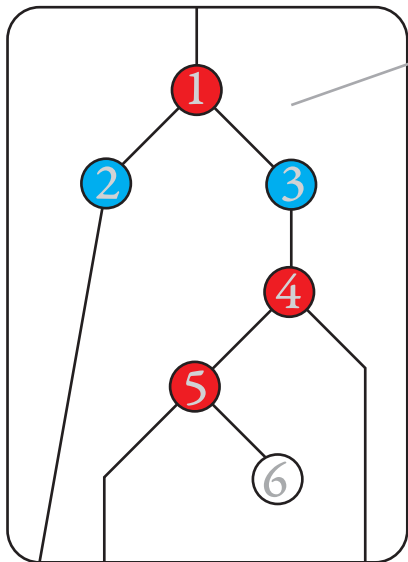


descendant equivalence





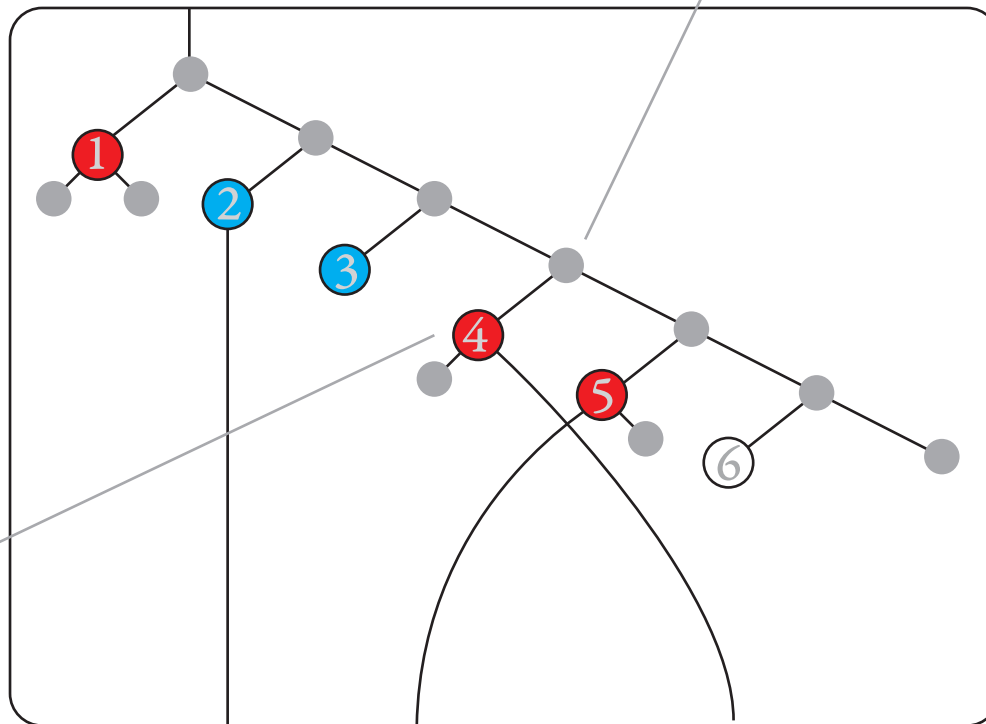
input



number the non-port  
nodes in the input term  
according to their  
appearance in the  
pre-order traversal

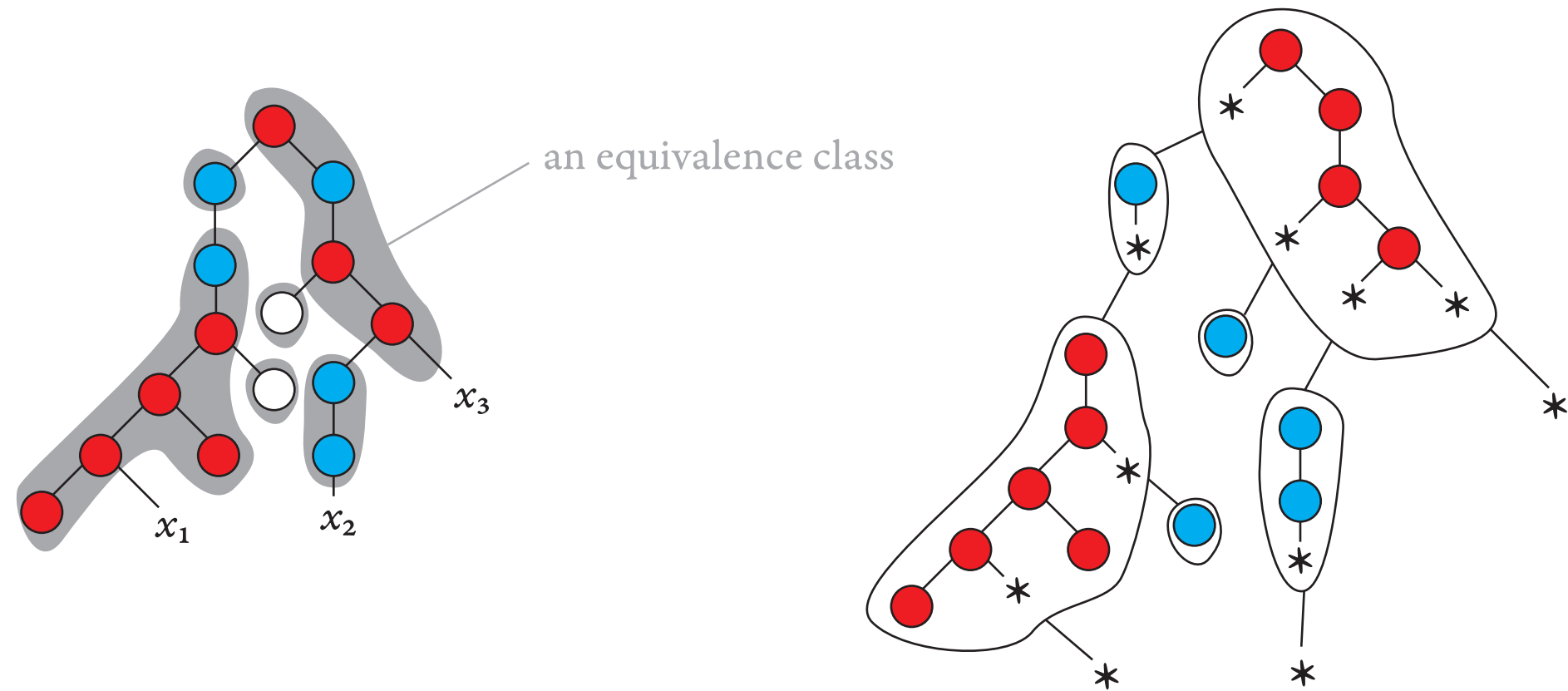
use a copy of the corresponding node, with  
edges to the ports inherited, and other edges  
plugged by ●

output

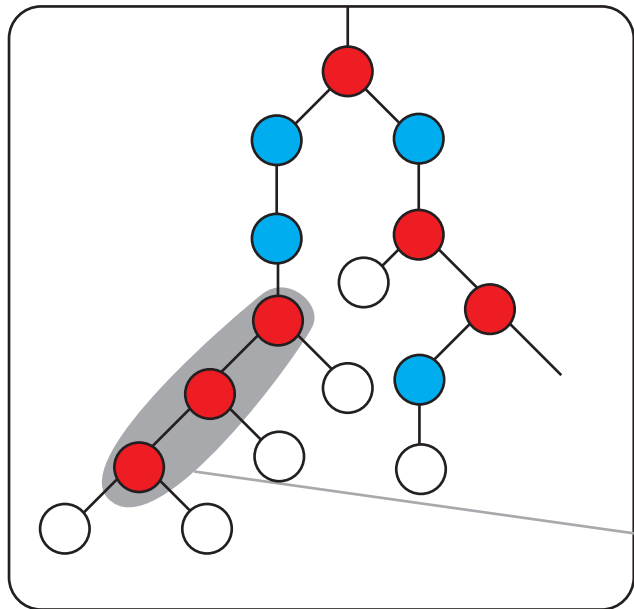


create a binary node for  
each non-port node in  
the input term

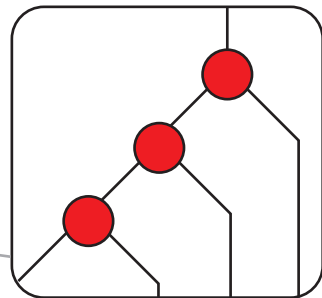
a factorisation equivalence



a tree



a factor of the  
tree, viewed  
as a term







input alphabet

arity 2



arity 1



arity 0



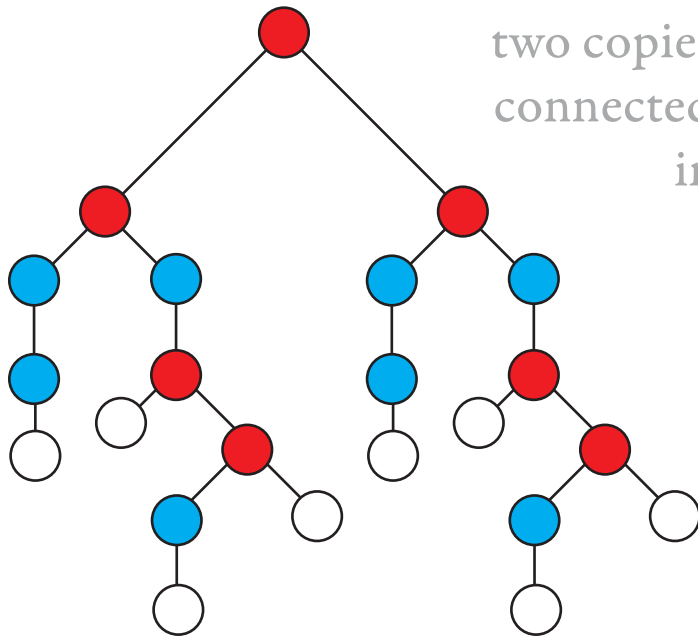
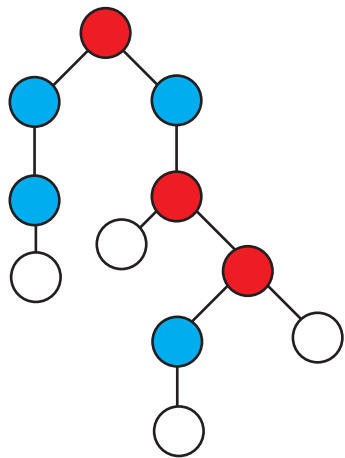
output alphabet

arity 2



arity 0





two copies of the input tree,  
connected by a binary node  
in the root





input alphabet

arity 2



arity 1



arity 0



output alphabet

arity 2



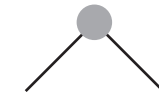
arity 1



arity 0

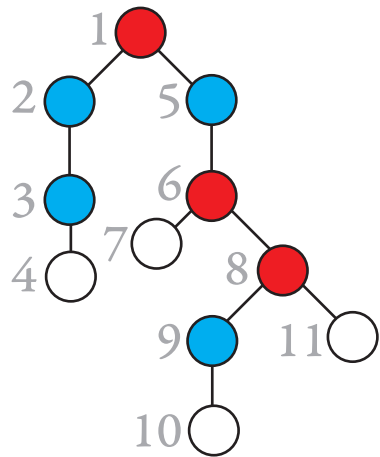


arity 2

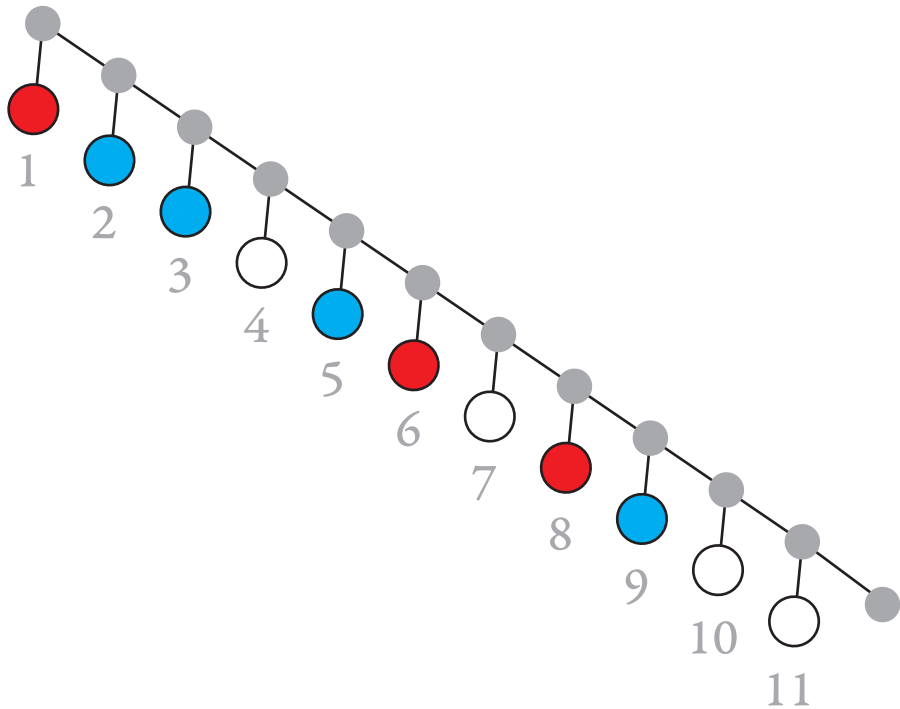


arity 0





$\mapsto$







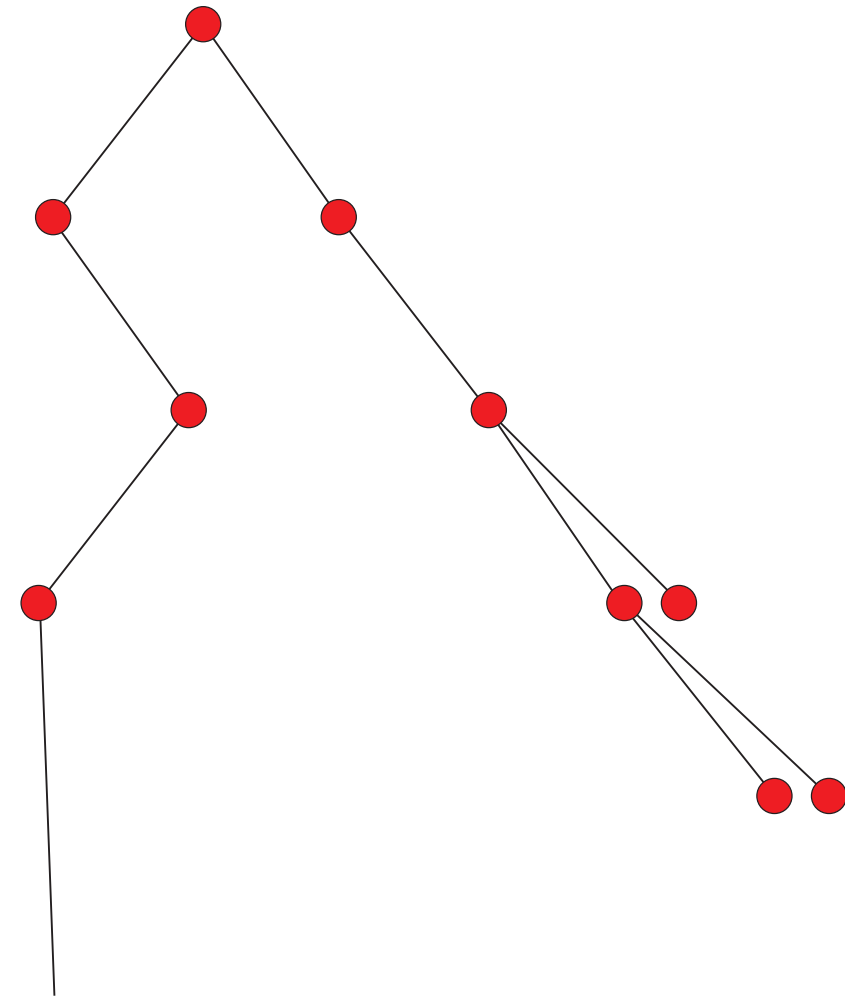
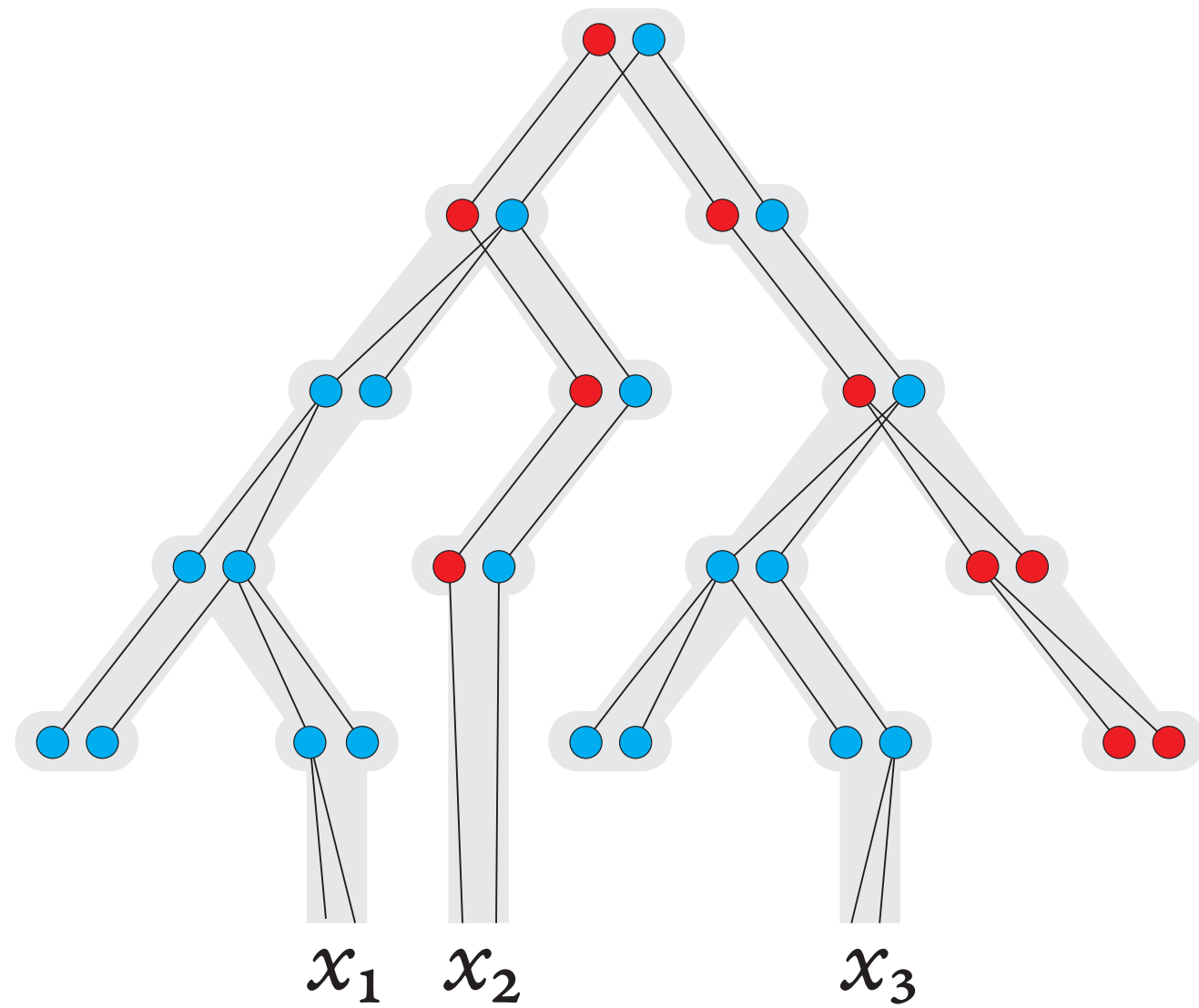
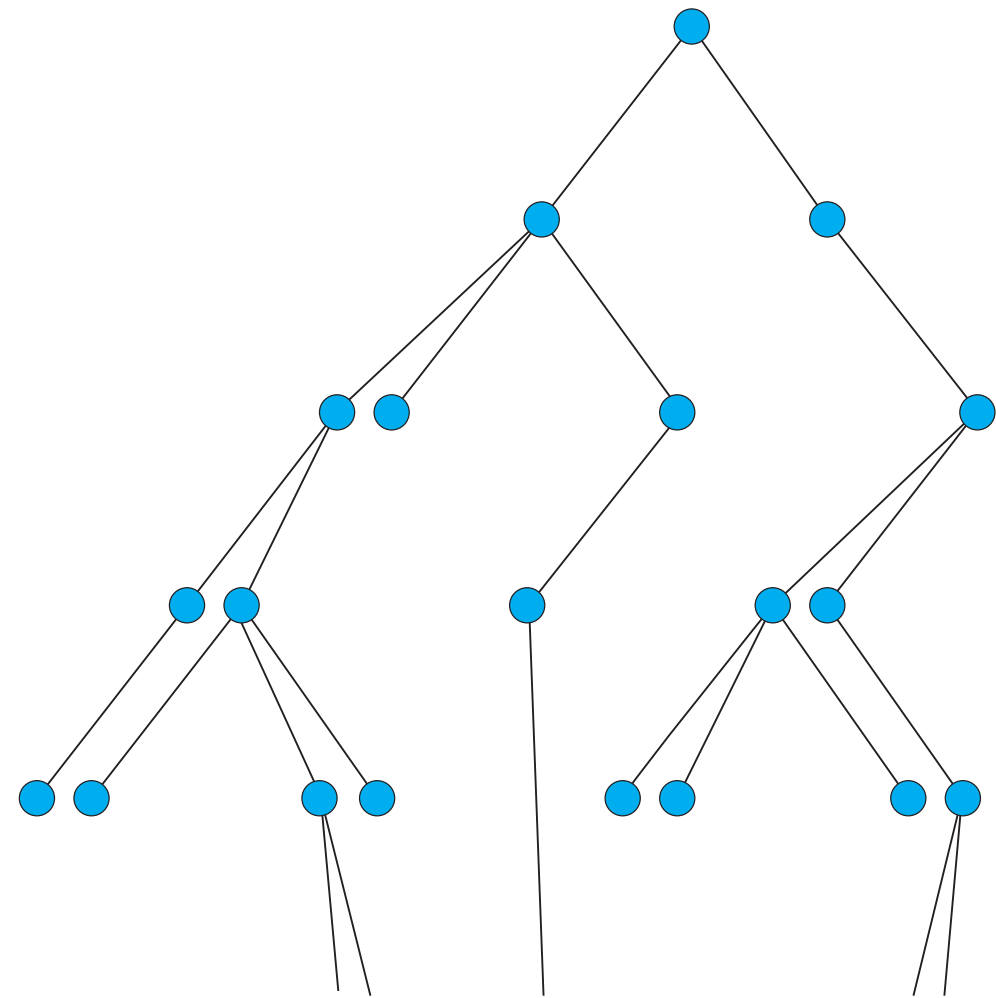


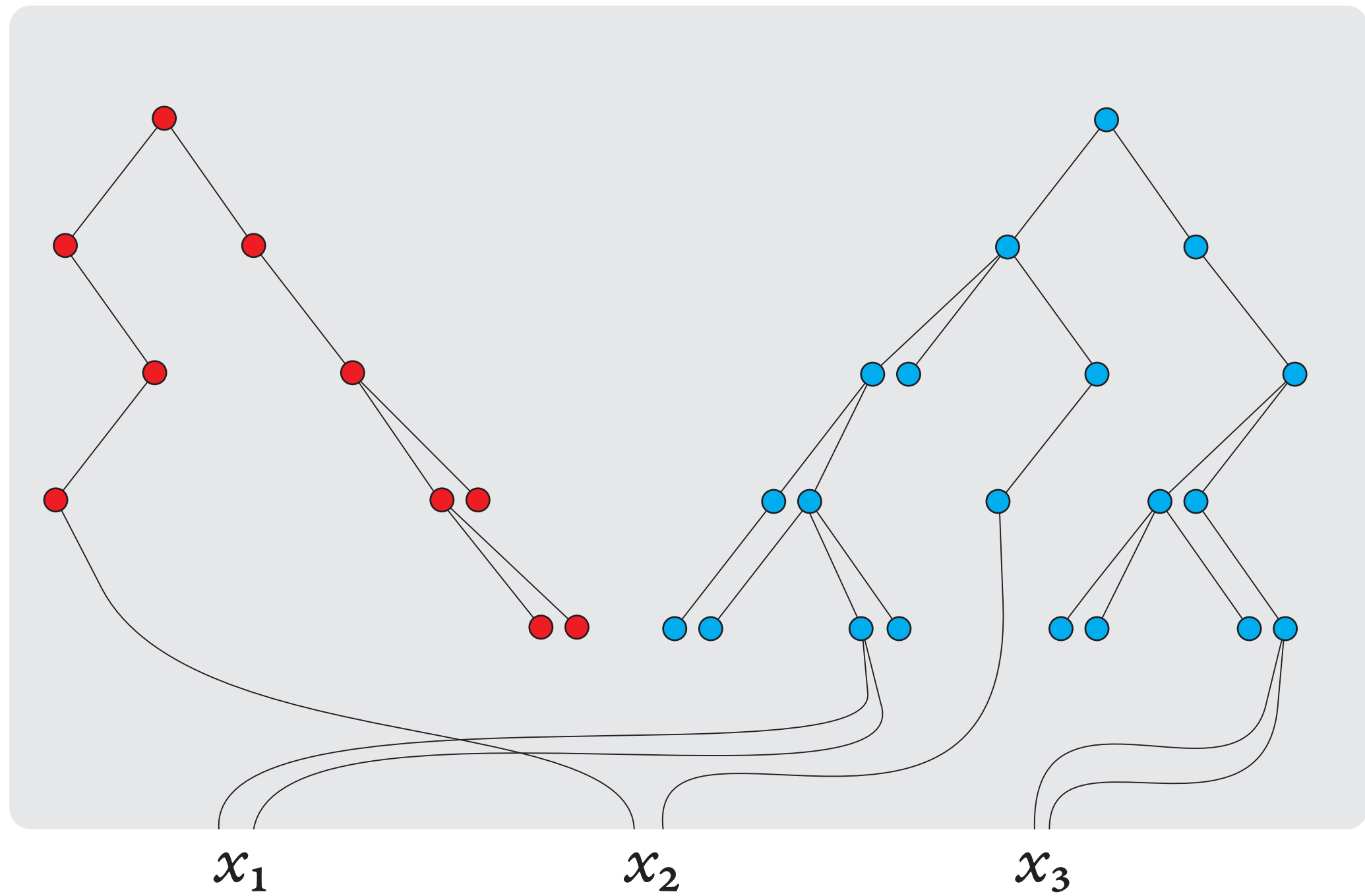
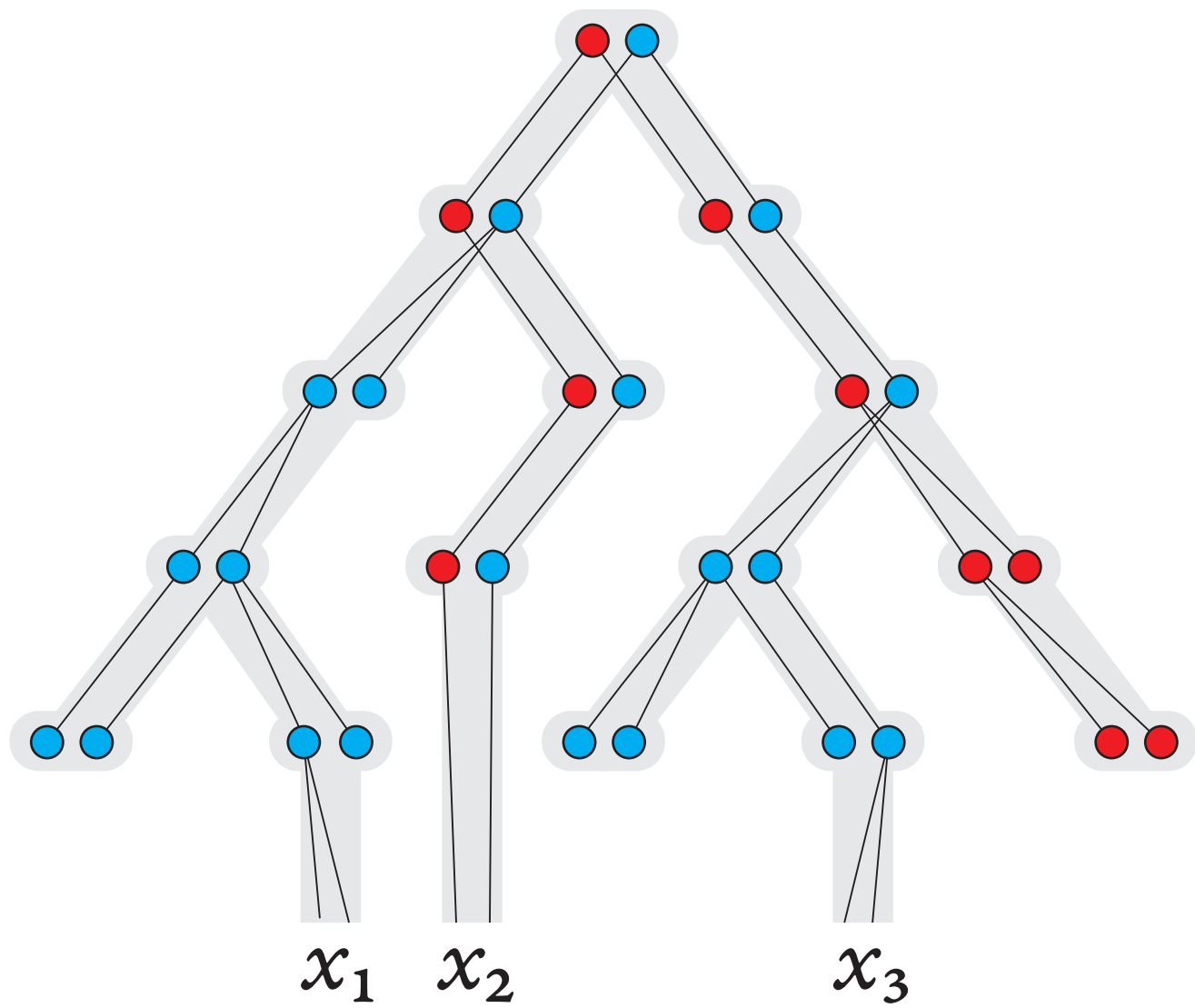
a term of arity 4

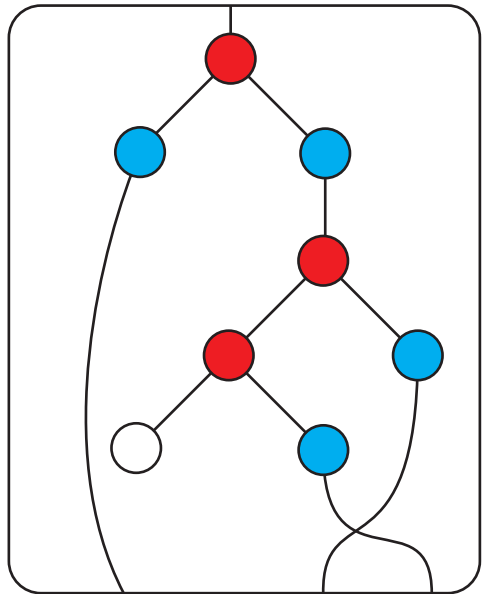


a term of arity 0





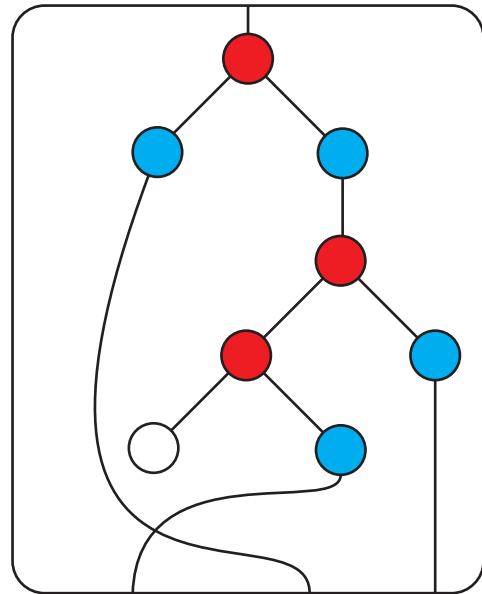




satisfies (\*)

(\*)

If the root has arity  $n$ ,  
and  $1 \leq i < j \leq n$ , then  
all ports of the  $j$ -th  
subterm of the root are  
after all ports of the  
 $i$ -th subterm of the root



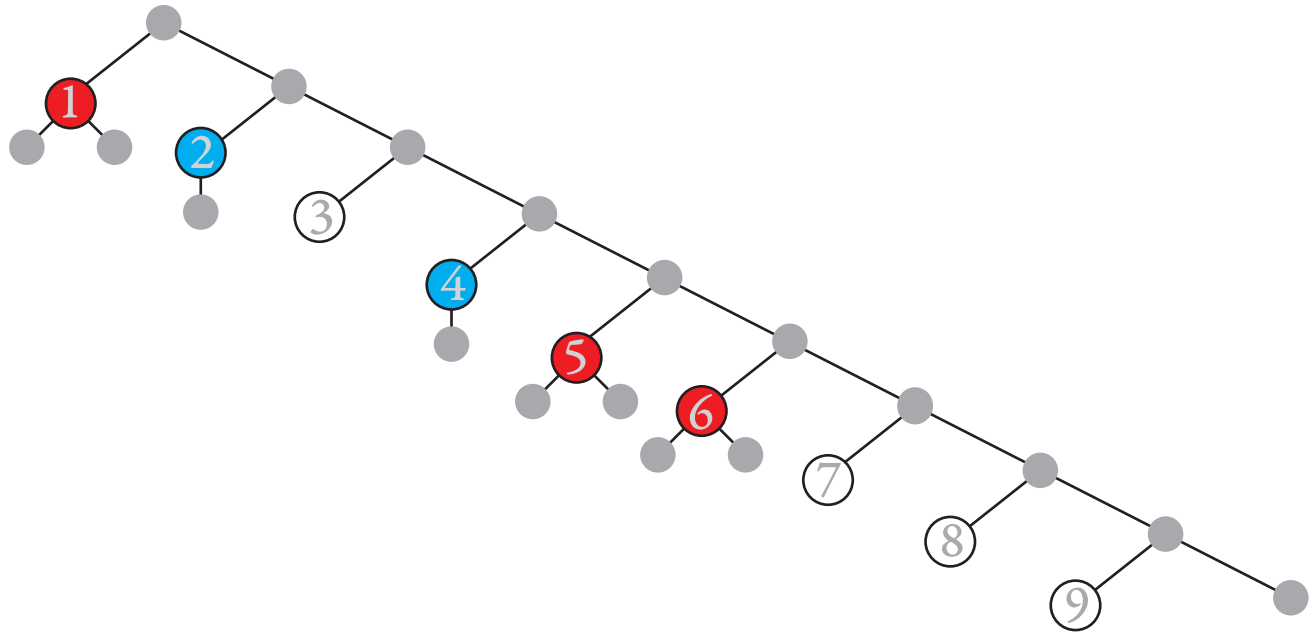
violates (\*)



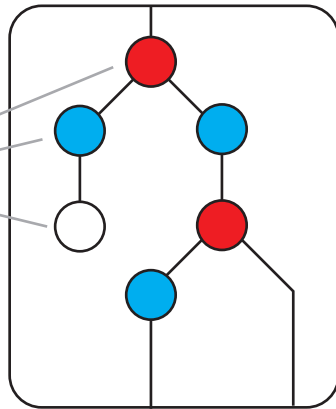
input



output

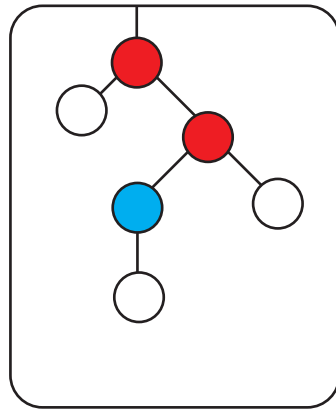


register  $r$

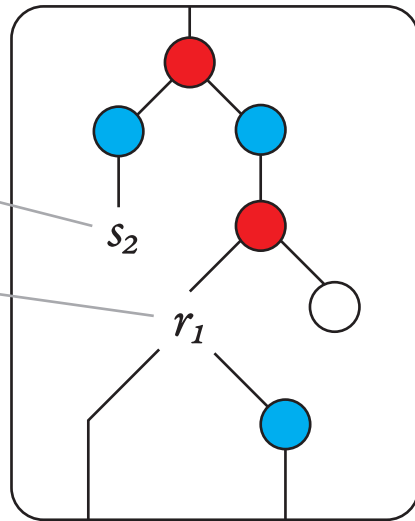


letters of the output alphabet

register  $s$



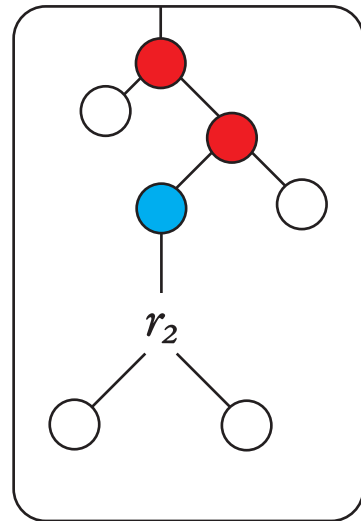
register  $r$



copy 2 of register  $s$

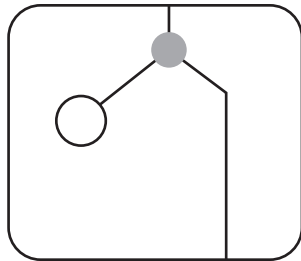
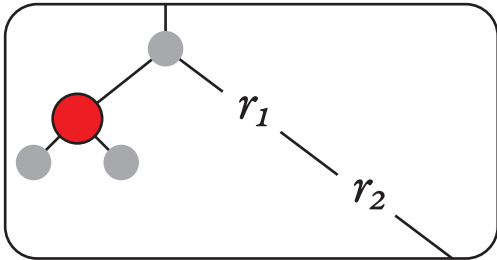
copy 1 of register  $r$

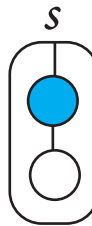
register  $s$











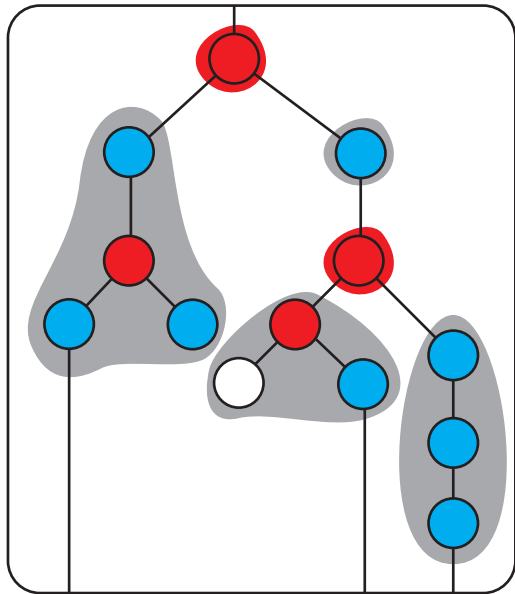




factors without  
branching nodes

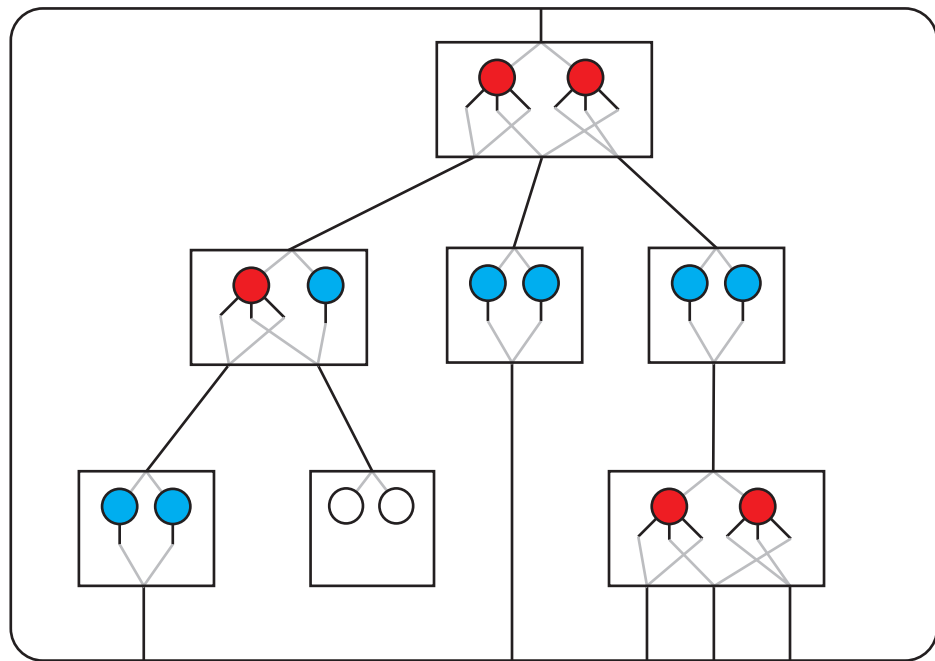


factors with  
branching nodes

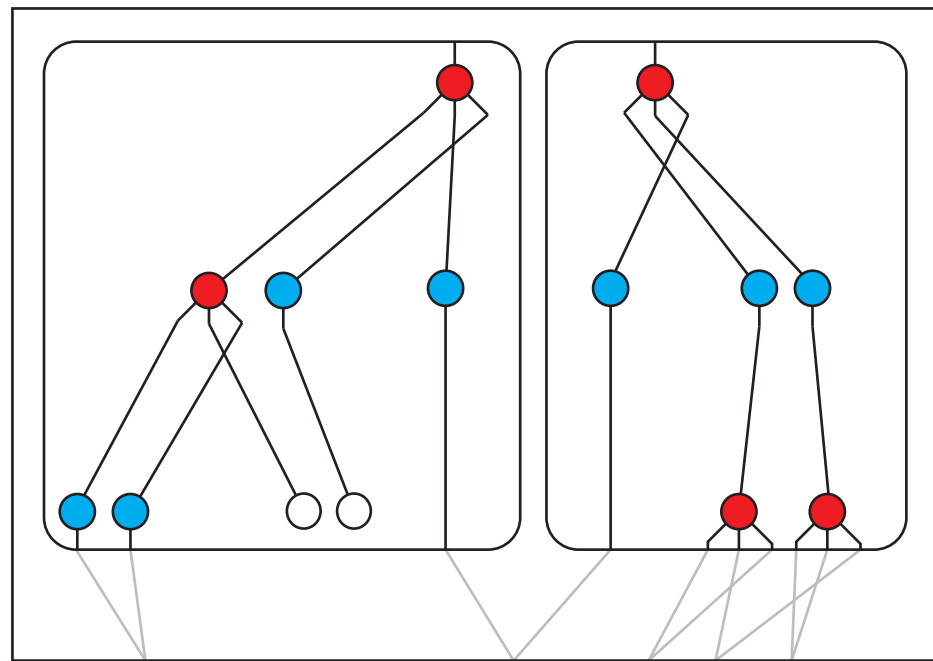




input



output









source 1 of  $e$

source 2 of  $e$

edge  $e$

target 1 of  $e$

target 2 of  $e$

