

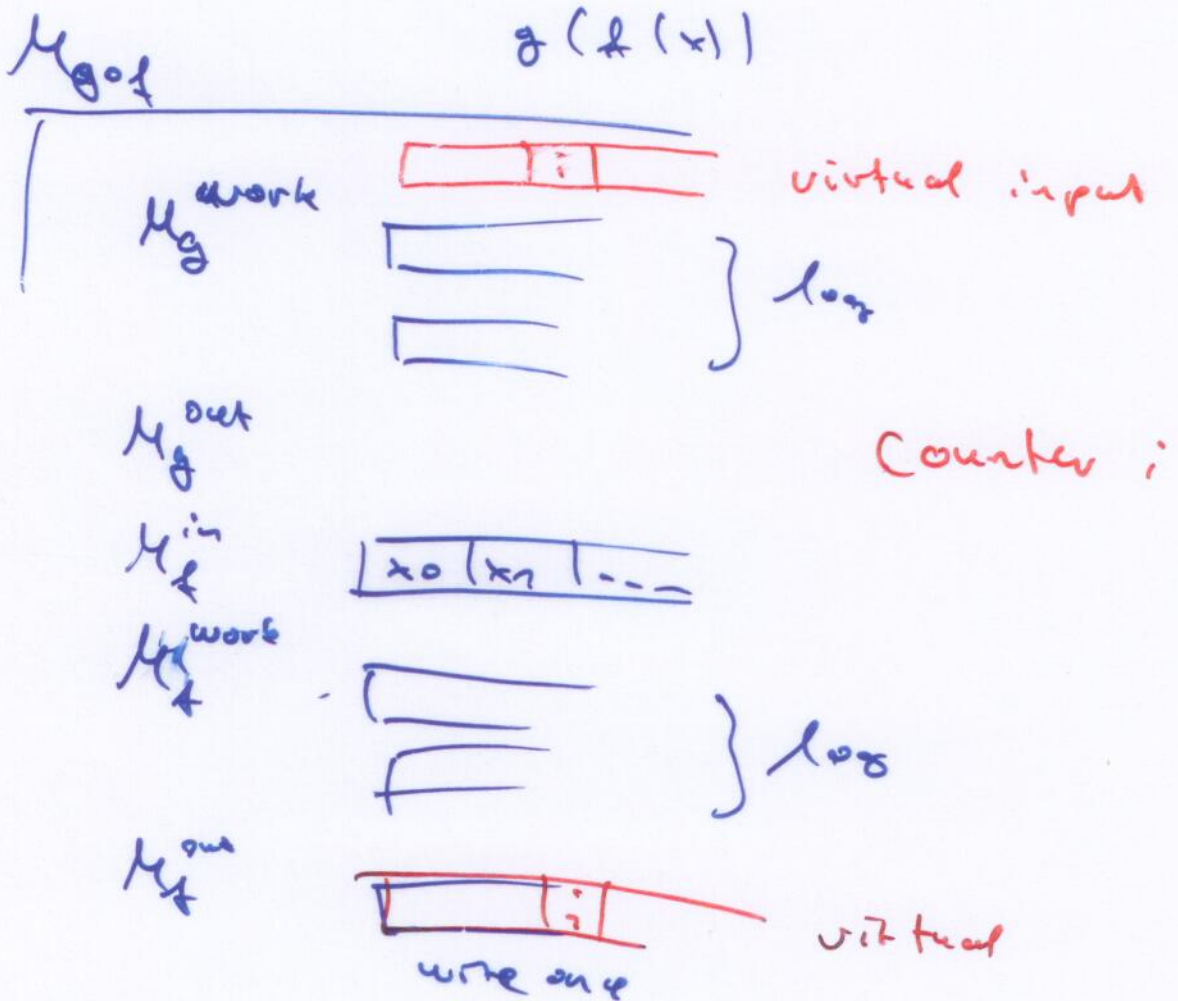


f in \log space

g in \log space

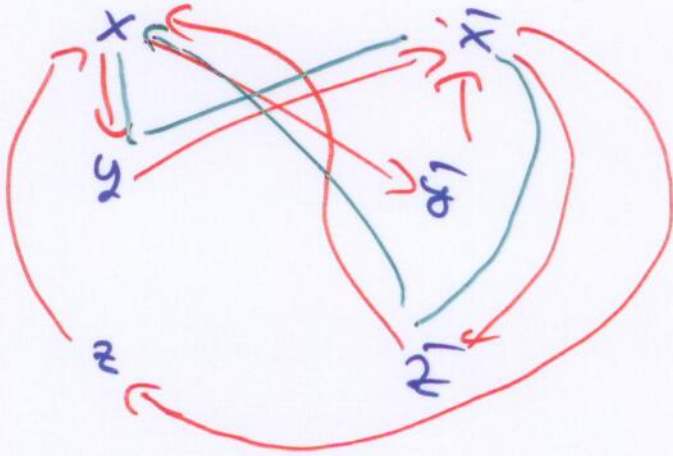
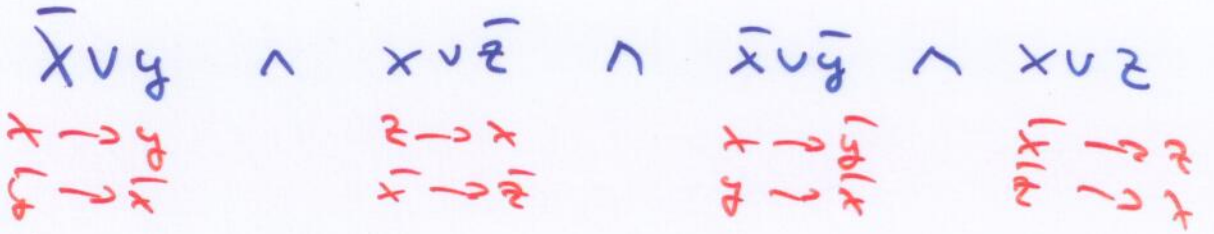
$$f \circ g = \{0, 1\}^* \rightarrow \{0, 1\}^*$$

$g \circ f$ in \log space

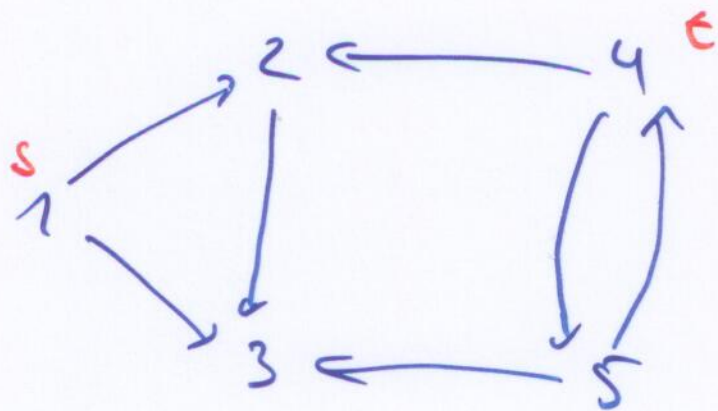


2

$x \rightarrow y \leftrightarrow x \rightarrow y$



paths $0 \rightarrow 1 \rightarrow 2$



C_i	nodes	C_0	$\in C_1$	$\notin C_1$	$\notin C_4$
$ C_i $		1	3		
1		1	1		
2			1, 2		
3			1, 3		
4					
5					

$\beta \rightarrow$ certificate that $4 \notin C_1$
 $\bigcirc - t$