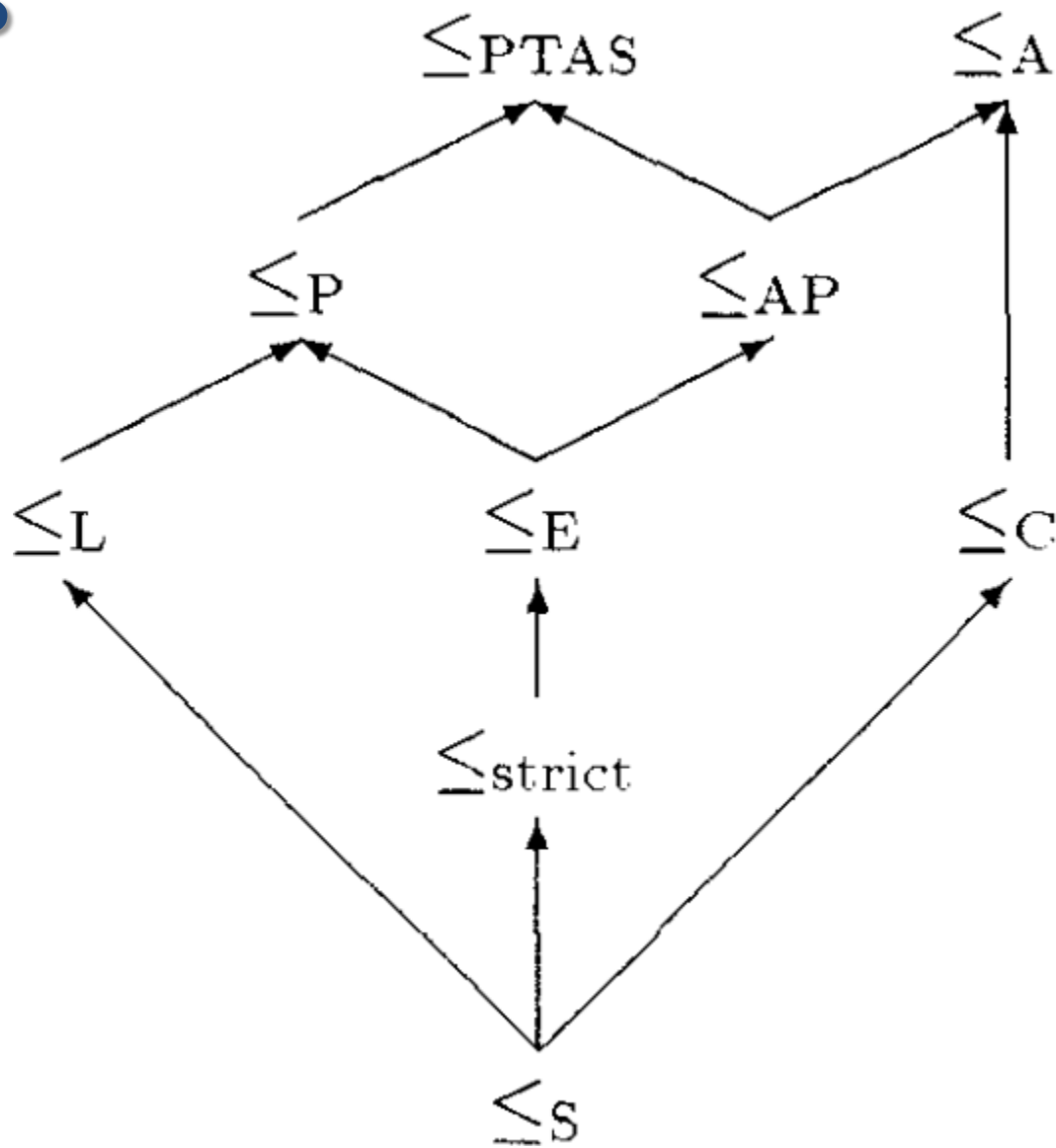


Typical Approximation Factors

Approximation Factor	Minimization Problems	Maximization Problems
$1 + \varepsilon$	Planar/ H -minor-free/2D ... e.g. dominating set	Planar/ H -minor-free/2D ... e.g. independent set
$\Theta(1)$	Steiner tree, Steiner forest, Traveling Salesman, ...	Maximum coverage, Max cut
$\Theta(\log^* n)$	Asymmetric k -center	
$\Theta(\log n)$	Set cover, Dominating set, Node-weighted Steiner tree ...	Unique coverage, Domatic number
$\Theta(\log^2 n)$	Group Steiner tree	
$\Omega(\log^2 n) \cap O(n^\varepsilon)$	Directed Steiner tree	
$\Omega(2^{\log^{1-\varepsilon} n}) \cap O(n^c)$	Label cover (MinRep), Directed Steiner forest	Label cover (MaxRep)
	$c = \frac{1}{3}$ $c = \frac{4}{5} + \varepsilon$	
$\Omega(n^{1-\varepsilon}) \cap \tilde{O}(n)$	Chromatic number	Independent set = clique



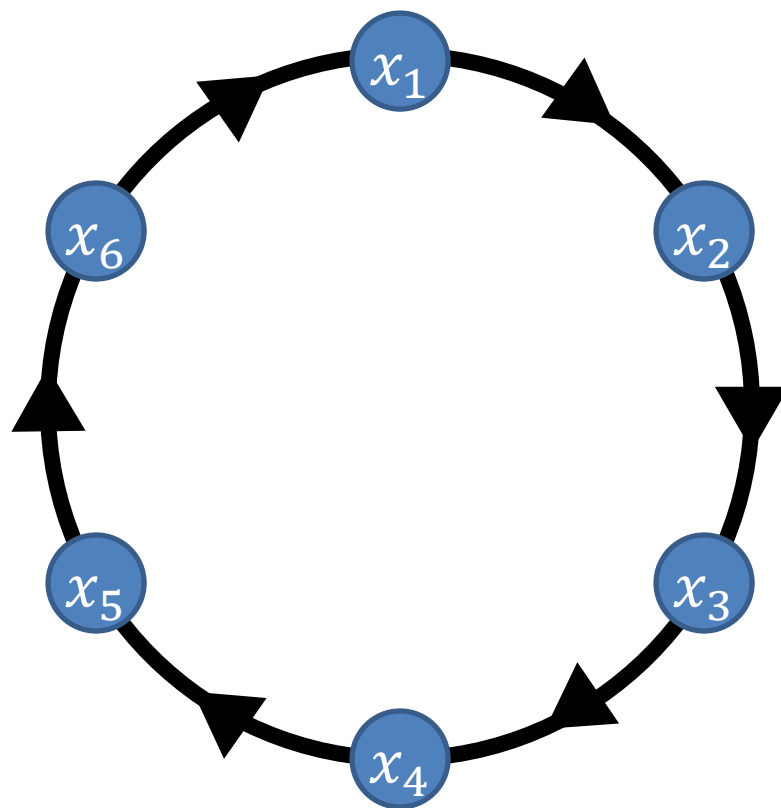
Reductions



[Crescenzi 1997]

3SAT-3

e.g. [Papadimitriou & Yannakakis 1991]

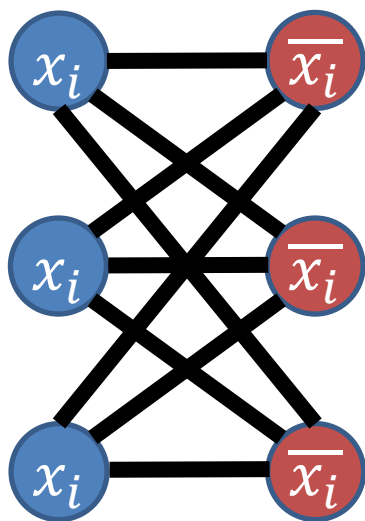


$$x_i \Rightarrow x_{i+1}$$
$$\neg x_i \vee x_{i+1}$$

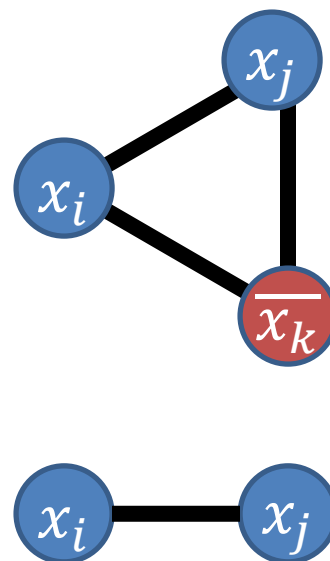


Independent Set

[Papadimitriou & Yannakakis 1991]



variable



clause