6.5440	Class 10	Nov. 13, 2023

Inapproximability reductions:

easier: compare to "ideal"
downside: no APX-hardness

L-reduction
- abs. error relation
- ⇒ preserve OPT

gap-preserving reduction
- specific gap, e.g. comparing to "ideal"

preserves

APX-hardness
- complexity class

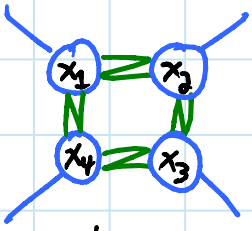
gap hardness
- specific gap is hard
- ⇒ "stronger" inapprox.

implies

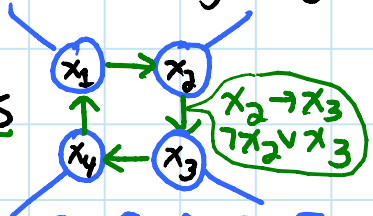
NP-hard to approximate
- solving all gaps is hard

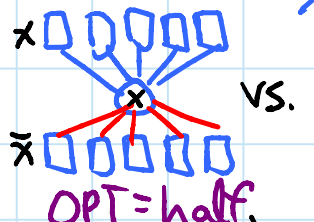
Examples: [L17]

- 3SAT → 3SAT-29 via expanders is L-reduction
  - preserves OPT: big cuts ⇒ can set to majority

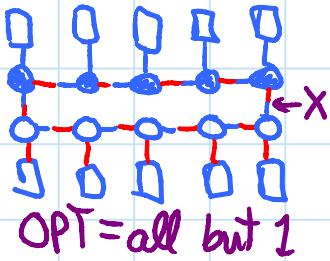


- 3SAT-29 → 3SAT-3 via implications is gap-preserving reduction
  - doesn't preserve OPT:





vs.



  - preserves ideal (fully satisfied) & $(1-\Theta(\varepsilon))\cdot$ ideal : $\Theta(x)$ violations ← x violations