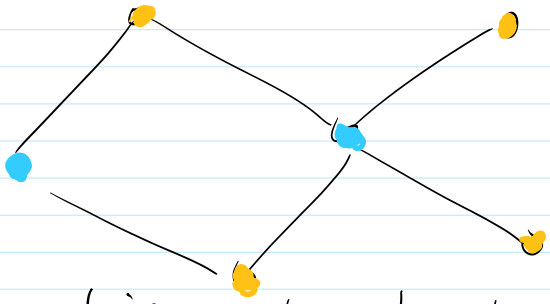
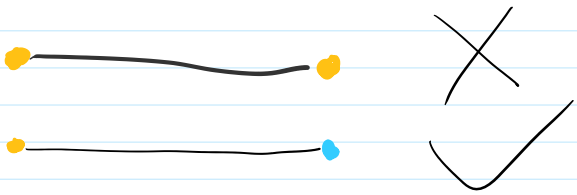
Lecture 22 Complexity Classes, Reduction

Tuesday, November 28, 2017 2:41 PM

- Similar statement, different difficulty

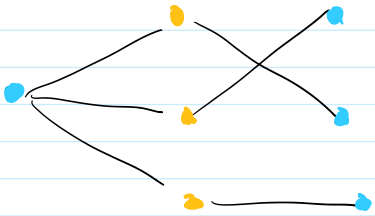


- graph coloring: assign colors to vertices, so that connected vertices are of different color

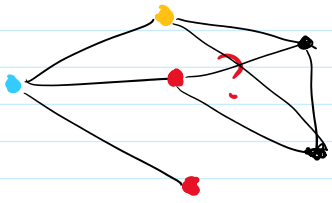


minimize number of colors used.

- 2-COLORING
  - can solve by BFS (color odd layers blue, even layers yellow)



- 3-COLORING



- simple reduction examples
  - LIS 5, 4, 6, 1, 2, 3, 9, 8, 10

    1, 2, 3, 8, 10

- LCS (2), 1, (3), 4, (6), (5)
  (2), (3), 1, (6), (5), 4
  2, 3, 6, 5

- Given: solution to LCS
  LCS(a[], b[])

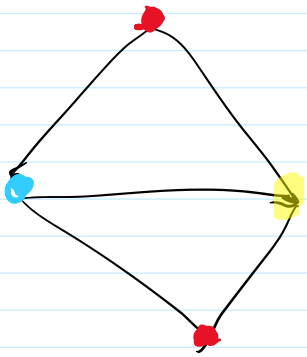
```
LIS(a[])
    b[] = sort(a[])
    return LCS(a[], b[])
```

a[] 5, 4, 6, (1), (2), (3), 9, (8), (10)
sort b[] (1), (2), (3), 4, 5, 6, (8), 9, (10)

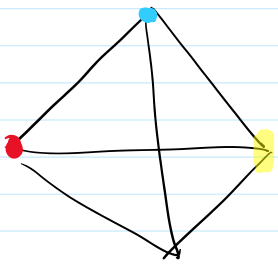
can prove ①: any Common subsequence of a[], b[], is an increasing subseq. of a[].

② any increasing subseq of a[] is a common subseq. of a[], b[].

- Example of NP-problem
  - 3-COLORING.
    - Is there a way to color G using 3 colors?



Yes



No

- Prover: answer Yes/No. if Yes, also give a coloring.