Summary of Class Topics

Asymptotics

- Relationship between polynomial, exponential, logarithmic time

- Big-Oh notation

Graphs

- Relationship between degree and number of edges

- Cycles, trees

- Graph Search

- Algorithms for coloring

- Negative Edge Weights in Directed graphs

Greedy Algorithms

- Interval Scheduling

- Approximation algorithms for Vertex Cover, Set Cover

- Minimum Spanning Tree Algorithms, and Cycle and Cut properties

- Union Find-Data Structure

Divide and Conquer Algorithms

- Recurrences (Master Theorem)

- Algorithms for merge sort, finding closest pair, multiplication, finding closest pairs, matrix multiplication, computing the median

- Fast Fourier transform

Dynamic Programming

- Design the recurrence using subproblems, then write the program. Many types of recurrences.

- Algorithms for sequencing related problems, edit distance, knapsack, weighted interval scheduling, algorithms on trees.

Network Flows

- Algorithms for max-flow, min-cut

- Applications to Image segmentation, project selection, edge-disjoint paths, maximum matchings in bipartite graphs, Marriage theorem.

Linear Programming

- Writing linear programs

- Min-max theorem

- Weak and strong duality

- Simplex and ellipsoid algorithms

NP

- Concept of NP-completeness

- NP-complete problems: 3SAT, 3Coloring, Independent set, Hamiltonian cycle

I hope

- You learnt a lot

- You are a better at communicating ideas

- The high level principles stay with you

Final

- Cheat sheet allowed: handwritten, double sided 8.5 by 11 inch

- Lots of true/false questions, a few problems

Thanks!