2/25/04

Material covered in class until 2/18/04
This is the material relevant for the midterm

Week	Material
1	**Describing and analyzing algorithms (Ch. 2.1, 2.2)** Algorithm description, loop invariant; best case and worst case runtimes **Asymptotic notation (Ch. 3.1), analyzing algorithms** O, Ω, Θ, o, limit-theorem; runtime for code-snippets, harmonic number
2	**Divide-and-conquer (Ch. 2.3) and recurrences (Ch. 4.1, 4.2)** Divide-and-conquer, merge sort, runtime recurrences. Solving recurrences with recursion tree; proving with substitution method (induction)
3	**Master theorem (Ch. 4.3), more divide-and-conquer (slides)** Use of master theorem to solve recurrences. Divide-and-conquer slides: Binary search, repeated squaring for exponentiation (31.6 pages 879–880), polynomial multiplication (see Ch. 30 pages 822–824), Strassen's matrix multiplication (Ch 28.2). **Randomized algorithms, random variables and expected values (Ch. C.3)** Expected runtime analysis. Random variables, expected value.
4	**Quicksort (Ch. 7; slides)** Quicksort, randomized quicksort, expected runtime analysis. **Heapsort (Ch. 6)** Abstract data types (ADT), priority queue, heap, heapsort, linear-time buildheap
5	**Sorting (Ch. 8.1, 8.2, 8.3)** Decision trees, lower $\Omega(n \log n)$ bound for comparison sorts, counting sort, radix sort
6	**Order statistics (Ch. 9)** Randomized selection, deterministic selection in linear time **Hashing (Ch. 11; not 11.3.3 and not 11.5)** Direct-access tables, chaining, open addressing with linear probing, quadratic probing, double hashing. Hash functions

- Use the **slides** as an additional resource.

- **Formulas:** Ch. 3.2 contains formulas for floors, ceilings, exponentials, logarithms, factorials. Appendix A contains summation formulas.

Practice questions from the book

- page 21: 2.1-3, 2.1-4
- page 27: all exercises
- page 36: 2.3-3, 2.3-4, 2.3-5, 2.3-6
- page 37: 2-1, 2-2, 2-3
- page 50: 3.1-1, 3.1-2, 3.1-3, 3.1-4, 3.1-5, 3.1-6
- page 58: 3-2, 3-3, 3-4
- page 67: 4.1-1, 4.1-2, 4.1-3, 4.1-5
- page 72: 4.2-1, 4.2-3, 4.2-4
- page 75: 4.3-1, 4.3-2, 4.3-3
- page 85: 4-1, 4-3, 4-4
- page 98: 5.2-1, 5.2-2, 5.2-3, 5.2-4
- page 118: 5-2
- pages 129, 132, 135: all exercises
- page 136: 6.4-2, 6.4-3
- page 142: 6.5-8, 6-1, 6-2
- page 148: page 7.1-3, 7.1-4
- page 153: 7.2-1, 7.2-2, 7.2-3
- page 163: 7-6
- page 167: 8.1-1
- page 170: 8.2-2, 8.2-3, 8.2-4
- page 173: 8.3-1, 8.3-2, 8.3-3, 8.3-4
- page 178: 8-2, 8-3
- page 189: 9.2-3, 9.2-4
- page 192: 9.3-5, 9.3-7, 9.3-8, 9-1, 9-2
- page 222: 11.1-1, 11.1-2, 11.1-3
- page 228: 11.2-1, 11.2-2, 11.2-3, 11.2-4, 11.2-5
- page 244: 11.4-1, 11.4-2