Homework 4

Use the PDF problem set posted to the course website; its problem numbering differs from the textbook.

Recitation problems (ungraded)

Attempt these before recitation. We will use recitation to work through selected solutions and the ideas behind them; they are chosen to prepare you for the graded problems below.

(1) DMC Problem 8.9
(2) DMC Problem 8.12 (a), (b)
(3) DMC Problem 8.13
(4) DMC Problem 8.14
(5) DMC Problem 8.18
(6) DMC Problem 8.19 (a), (b). You may assume the RBT is nonempty.
(7) DMC Problem 9.2 (a), (e)
(8) DMC Problem 9.10
(9) DMC Problem 9.22

Problems to submit (100 points)

Show your work and explain your reasoning. A correct answer without adequate justification may receive little or no credit. Write in complete, grammatically sound sentences and submit legible work. The number in square brackets is the number of points each problem is worth.

(1) **[5]** DMC Problem 8.8
(2) **[15]** DMC Problem 8.10
(3) **[10]** DMC Problem 8.11
(4) **[10]** DMC Problem 8.15
(5) **[10]** DMC Problem 8.19 (c), (d)
(6) **[10]** DMC Problem 8.20 (a), (b)
(7) **[10]** DMC Problem 9.2 (c), (i)
(8) **[12]** DMC Problem 9.18 (a), (f), (h), (i)
(9) **[8]** DMC Problem 9.21
(10) **[10]** DMC Problem 9.24

Bonus challenge: Catalan Numbers (up to 10 bonus points)

This problem is completely optional and is meant to be substantially more challenging than the required homework. Each part is graded all-or-nothing: a complete proof earns the listed bonus points, while an incomplete proof earns no points for that part. Bonus points are added to your homework score, up to a maximum score of **110/100**.

Bonus Challenge: **DCM Problem 8.48**.

- The generating function, as introduced in DCM Problem 8.41, is defined to be $G(s) = \sum_{i=0}^{\infty} C_i s^i$.
- In part (f), the expression for a_k should read $-2^k \times 1 \cdot 3 \cdot 5 \cdots (2k-3)$, and in (g), we should have $C_n = -a_{n+1}/[2(n+1)!]$.
- Parts (e) and (g) are worth **2 bonus points** each; the other parts are worth **1 bonus point** each.