

CMSC 441

Homework 4

Reading Assignment:

- Listen to Rachmanioff's Piano Concerto No. 4.
- Read Chapter 4 of text, and the Brassard/Bratley (BB) handout

Homework:

- 1) Problem 2.3.7, page 75 of BB handout
- 2) Problem 2.3.9, page 76 of BB handout
- 3) Problem 2.3.10, page 76 of BB handout
- 4) Problem 2.3.12, page 76 of BB handout
- 5) The n -th Fibonacci number $F(n)$ is defined by the following recursion

$$\begin{cases} F(n) = F(n-1) + F(n-2) & \text{for } n \geq 2 \\ F(0) = 0, \quad F(1) = 1 \end{cases}$$

Given that the Fibonacci numbers satisfy the following equality

$$\begin{bmatrix} F(n-1) & F(n) \\ F(n) & F(n+1) \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}^n \quad \text{for } n \geq 2,$$

construct (in pseudo code) an algorithm that computes the n -th Fibonacci number in time complexity $\Theta(\log n)$. Then explain why your algorithm is of time complexity $\Theta(\log n)$.

Hint. Use the method of repeated squares for computing matrix powers.