

Sample Midterm Exam

Instructor: Dieter van Melkebeek

Guidelines:

- This sample gives you an idea what to expect for the second midterm exam. The actual exam will be in two parts and will contain extra credit problems. Also, the questions will be spaced out so you can answer them on the sheets you are given.
- The solutions to the sample exam will be discussed during the review sessions of 3/21.

Questions:

1. Problem 4 of HW 6.
2. Problem 5 of HW 6.
3. Consider a game in which you are given a $2 \times n$ board, and you win by tiling the board with 2×2 , 2×1 and 1×2 tiles.
 - (a) Set up a recurrence for the number of winning strategies as a function of n .
 - (b) Solve the recurrence.
4. Determine which of these choices

$\Theta(1)$, $\Theta(n)$, $\Theta(n^2)$, $\Theta(n^2 \log n)$, $\Theta(2^n)$, $\Theta(2^{n \log n})$, none of these

describes each function's asymptotic behavior. Explain your answers.

- (a) $n + \log n + (\log n)^2$
- (b) $\frac{n^2 + 2n - 3}{n^2 - 7}$
- (c) $\sum_{i=0}^n 2^{2i+1}$
- (d) $\log(\prod_{i=1}^{n^2} i)$
- (e) $\sum_{i=1}^n i(1 - \frac{1}{2^i})$