

# CS 473: Undergraduate Algorithms, Spring 2009

## Homework 3

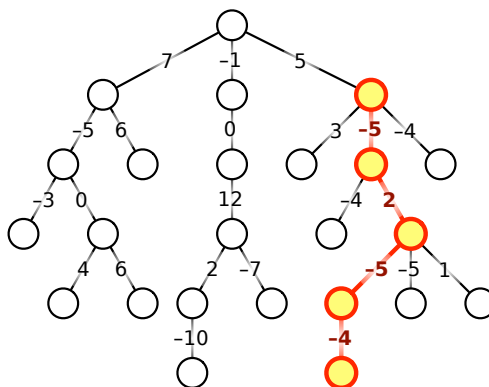
Written solutions due Tuesday, February 17, 2009 at 11:59:59pm.

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1. Redo Homework 2, but now with dynamic programming!
  - (a) Describe and analyze an efficient algorithm to compute the minimum number of 1's in a basic arithmetic expression whose value is a given positive integer.
  - (b) Describe and analyze an efficient algorithm to compute the length of the longest bitonic subsequence of a given input sequence.
  - (c) Describe and analyze an efficient algorithm to compute the minimum number of palindromes that make up a given input string.

Please see Homework 2 for more detailed descriptions of each problem. **Solutions for Homework 2 will be posted Friday, after the HW2 oral presentations.** You may (and should!) use anything from those solutions without justification.

2. Let  $T$  be a rooted tree with integer weights on its edges, which could be positive, negative, or zero. Design an algorithm to find the minimum-length path from a node in  $T$  down to one of its descendants. The length of a path is the sum of the weights of its edges. For example, given the tree shown below, your algorithm should return the number  $-12$ . For full credit, your algorithm should run in  $O(n)$  time.



The minimum-weight downward path in this tree has weight  $-12$ .

3. Describe and analyze an efficient algorithm to compute the longest common subsequence of *three* given strings. For example, given the input strings EPIDEMIOLOGIST, REFRIGERATION, and SUPERCALIFRAGILISTICEXPLODOCIOS, your algorithm should return the number 5, because the longest common subsequence is EIEIO.