

CS 2412 Data Structures
Fall, 2007

Lab 6:

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Time and location: Mon 9:30 - 10:30 a.m., AT 3001

Web: <http://peace.lakeheadu.ca/cs2412.html>

Recursion algorithms are used in many search algorithms. You are asked to write the following computer programs using recursive methods.

- A function $f(n)$ is defined on nonnegative integers as follows:

$$f(n) = \begin{cases} n & \text{if } n \leq 1; \\ n + f(\frac{1}{2}n) & \text{if } n \text{ is even, } n > 1; \\ f(\frac{1}{2}(n+1)) + f(\frac{1}{2}(n-1)) & \text{if } n \text{ is odd, } n > 1. \end{cases}$$

Compute the values of $f(6)$, $f(11)$, $f(34)$, $f(81)$.

- **Ackermann's function** $A(m, n)$ is defined as follows.

$$\begin{aligned} A(0, n) &= n + 1 && \text{for } n \geq 0. \\ A(m, 0) &= A(m - 1, 1) && \text{for } n \geq 0. \\ A(m, n) &= A(m - 1, A(m, n - 1)) && \text{for } m > 0 \text{ and } n > 0. \end{aligned}$$

Compute the following values: $A(0, 0)$, $A(2, 0)$, $A(4, 3)$, $A(4, 0)$.