Math 135: Discrete Mathematics, Fall 2010 Worksheet 9

1. An employee joined a company in 1999 with a starting salary of 50,000, and every year he gets a raise of 1,000 plus 5 percent of his salary the previous year. Set up a recurrence relation for the salary of the employee n years after 1000, and then find an explicit formula for his salary.

- 2. The *Lucas numbers* satisfy the recurrence $L_n = L_{n-1} + L_{n-2}$, where $L_0 = 2$ and $L_1 = 1$.
 - (a) Show that $L_n = f_{n-1} + f_{n+1}$ for $n \ge 2$, where f_n is the n^{th} Fibonacci number.
 - (b) Find an explicit formula for the Lucas numbers.

- 3. Find *general* solutions of the following recurrences. (Note: this means you don't have to solve for constants!)
 - (a) $a_n = 5a_{n-1} 6a_{n-2}$

(b)
$$b_n = 2b_{n-1} + 3 \cdot (-2)^n$$

(c)
$$c_n = 4c_{n-1} - 4c_{n-2} + 3^n$$

(d)
$$d_n = 4d_{n-1} - 4d_{n-2} + 2^n$$

(e)
$$d_n = 4d_{n-1} - 4d_{n-2} + 3n^3 - n^2 + 1$$

(f)
$$d_n = 4d_{n-1} - 4d_{n-2} + n^2 2^n$$