Name (please print):

Math 213, Spring 2006
HW Assignment 8

Instructions

- **Write your name on the cover sheet and staple the sheet to the assignment.** Do the problems in order, and make sure that each problem is clearly labelled.
- **Deadline:** The assignment is due in class on **Friday, March 31**. (This means that you have a full 15 days to complete the assignment. There will be another homework assignment given out Monday after Spring Break, and also due on March 31.)
- **Open House:** I plan to have an Open House Wednesday and/or Thursday after Spring Break, at the usual place and time (5 pm, 147 Altgeld).

Reading/review exercise

The generating function method of Section 6.4, which I will cover right after the break, depends on some knowledge about power series. This is Calculus II material, and you should review it in preparation for Section 6.4. In particular, review the following:

- Power series (MacLaurin series) expansions of the following functions, along with the intervals of convergence: e^x, $\ln(1+x)$, $1/(1-x)$. (See the table on p. 440 of Rosen for these and some other expansions.)
- Differentiation and integration of power series.
- Addition/subtraction, and multiplication of power series.
- Finite and infinite geometric series. Know the formula for the sums of these.
- Power series expansion of $(1+x)^n$ via the Binomial Theorem. (See Section 4.4 of Rosen.)

Note that convergence tests, which are covered *ad nauseum* in calculus classes, are not relevant here. Also, not particularly important is the explicit computation of a the coefficients power series expansion for a given function $f(x)$ by the formula $a_n = f^{(n)}(0)/n!$.
The important thing is that you know, and be able to recognize, some basic power series expansions like those listed above, and that you can manipulate these series, e.g., via differentiation, integration, or multiplication of power series.
This material is covered in Chapter 10 (mainly Sections 10.8 and 10.9) of Edwards/Penney, or in pretty much any calculus book.

—Turn page for HW 8 Problems—

HW 8 Problems

All problems are from Section 6.2. Most problems require solving a recurrence via the characteristic equation method of this section.

1. Problem 2 (Classification of recurrences) For each of the given recurrence determine whether it is linear or nonlinear, homogenous or nonhomogeneous, has constant coefficients or nonconstant coefficients, and specify the degree (order) of the recurrence. (Feel free to use appropriate abbreviations, e.g.: L/NL, H/NH, C/NC.)
2. Problem 4(a)
3. Problem 4(d)
4. Problem 4(e)
5. Problem 6: First set up a recurrence and initial conditions (this is similar to Problem 19 of 6.1), then solve the recurrence by the characteristic function method.
6. Problem 12
7. Problem 14
8. Problem 24
9. Problem 28
10. Problem 42: This problem deals with the general solution of the Fibonacci recurrence. Give **two** proofs of the asserted formula for a_n:
    (a) Use the characteristic equation method to derive a formula for a_n, then show that this formula agrees with the asserted one, taking into account the explicit formula for the Fibonacci sequence.
    (b) For the second proof, proceed as indicated in the problem, by use induction to show that the asserted formula holds for all n. This is an good (and rather easy) refresher on induction poofs, and you should pay attention to your write-up, which should be in a logically correct order, and include any necessary hypotheses.