Discrete Mathematics
Assignment RR

Moshe Rosenfeld

Hanoi 2012
moishe@u.washington.edu

Due: Tuesday (Dec 11)

1 Recurrence Relations

1.1 Telescoping

Use the telescoping technique to find t recurrence relation for the following sequences:

1. $1, 3, 6, 10, 15, 21 \ldots$
2. $1, 2, 3, 5, 16, 231, \ldots$
3. Solve $a_n = \sqrt{a_{n-1} \cdot a_{n-2}}, \quad a_0 = 2, a_1 = 1$. What is $\lim_{n\to\infty} a_n$.

1.2 Linear recurrence Relations

1. Solve: $a_n = 2a_{n-1} - a_{n-3},\ a_0 = 1, a_2 = 0, a_3 = 2$.
2. Find the general solution to: $a_n = 4a_{n-1} - 4a_{n-2} + 3n$

1.3 Misc recurrence relations

3. A domino is a 2×1 tile. In how many different ways can you arrange n dominoes to form a $2 \times n$ strip?*
4. How many binary sequences $b_1 b_2 \ldots b_8$ such that $\sum_{n=1}^{8} = 4$ and for each $1 \le j \le 8 \quad \sum_{i=1}^{j} b_j \ge \frac{j}{2}$ are there?

5. * Obtaun a recurrence relation for b_n, the number of binary sequences of length $2n$ containing exactly n $1's$ such that $\sum_{i=1}^{j} b_j \geq \frac{j}{2}$.

6. * Prove that for every positive integer n there is a an integer m such that $(\sqrt{(2)} - 1)^n = \sqrt{m+1} - \sqrt{m}$

7. * Prove that $(\sqrt{170} + 13)^n$ has at least n zeros after the decimal point.*