Discrete Mathematics
Drill

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1 Recurrence Relations

1. Solve: $a_n = a_{n-1} + 30a_{n-2},\ a_0 = 1, a_1 = 1.$
2. Solve: $a_n = 2a_{n-1} - a_{n-3},\ a_0 = 1, a_2 = 0, a_3 = 2.$
3. Find the general solution to: $a_n = 4a_{n-1} - 4a_{n-2} + 3n$
4. Solve: $a_n = 5a_{n-1} - 6a_{n-2} + 2^n,\ a_0 = 2, a_1 = 3.$
5. Solve $a_n = \sqrt{a_{n-1} \cdot a_{n-2}}, \quad a_0 = 2, a_1 = 1.$ What is $\lim_{n\to\infty} a_n$.
6. A domino is a 2×1 tile. In how many different ways can you arrange n dominoes to form a $2 \times n$ strip?
7. List all binary sequences $b_1 b_2 \dots b_8$ such that $\sum_{n=1}^{8} = 4$ and
   for each $1 \le j \le 8 \quad \sum_{i=1}^{j} b_j \ge \frac{j}{2}$
8. * How many binary sequences of length $2n$ containing exactly n $1's$ such that $\sum_{i=1}^{j} b_j \ge \frac{j}{2}$ are there?
9. * Prove that for every positive integer n there is a an integer m such that $(\sqrt(2) - 1)^n = \sqrt{m+1} - \sqrt{m}$
10. * Prove that $(\sqrt{50} + 7)^n$ has at least n zeros after the decimal point.