Math 218: Combinatorics

Homework 14 : Due November 15

1. (a) Bogart #220

   (b) Bogart #221 (Hint: read the hint in the book/pdf.)

2. Suppose that we want to study a colony of killer rabbits. Assume that the following rules apply to our rabbits.

   - Every pair of adult rabbits produces two pairs of baby rabbits each month.
   - Baby rabbits become adult rabbits at age one month and produce their first pairs of baby rabbits at age two months.
   - Killer rabbits are immortal.

   Let h_n denote the number of rabbit pairs in the colony at the end of the nth month.

   (a) Suppose we have $h_0 = 0$, $h_1 = 1$. Create a recurrence relation for h_n.

   (b) Use generating relations to find a closed form for h_n.

3. Find a closed formula for the recurrence relation $h_n = 3h_{n-1} - 2h_{n-2} + 2^n$ for $n \geq 2$ and $h_0 = h_1 = 1$.

4. (a) Use the binomial theorem to write $\sqrt{30}$ as an infinite series.

   (b) Compute the value in (a) for the first 5 terms of the series. How good of an approximation is it to $\sqrt{30}$?