Math 304 **Homework 3** **Due 10/21/2003**

1. Bóna, Chapter 4, Problems 3, 4, 20, 28, 31, 32. Extra Credit: Problem 30.

2. Roberts, Section 2.11, Problems 9(c,d), 10, 11, 12, 13, 15, 21.

Hints:

1. 3. Differentiate both sides of the binomial expansion of $(x+1)^n$ twice, then set $x = 1$. Alternatively, divide through by $n(n-1)$ and use the formula for the factorial to simplify both sides.

   20. Divide the left-hand side by the right-hand side and simplify as much as possible. Prove that the ratio is ≥ 1.

   30. Use the product rule and the sum rule. For the parts of paths after $(3, 3)$ use the fact that the number of "good" paths is the number of all paths minus the number of "bad" paths.

   31. Use the Vandermonde identity. Note that $2n = n + n$.

   32. Use the binomial expansion. Note that $3 = 2 + 1$.

2 10-15. Use the Twelvefold Way results.

   21. Choose the elements not in the same subset with n, then partition the set of these elements.