

Discrete Math  
Final Exam

1. Let  $k, n, r$  be positive integers. Show that the number of integer solutions to the equation

$$x_1 + x_2 + \dots + x_n = r$$

such that  $0 \leq x_i \leq k$  for each  $i = 1, 2, \dots, n$  is given by

$$\sum_{i=0}^n (-1)^i \binom{n}{i} \binom{r - (k+1)i + n - 1}{n - 1}.$$

2. Solve

$$a_n - 6a_{n-1} + 9a_{n-2} = 0$$

given  $a_0 = 2$  and  $a_1 = 3$ .