

Math 579 Exam 9 (part I): 5/3/7

Please read the exam instructions.

Please write your answers on **separate paper**, indicate clearly what work goes with which problem, and put your name on every sheet. Cross out work you do not wish graded; incorrect work can lower your grade, even compared with no work at all. Keep this list of problems for your records. Show all necessary work in your solutions; if you are unsure, show it. Each problem is worth a minimum of 5 points, and a maximum that is indicated. You have 40 minutes. *Choose three problems.*

1. (8 points) Solve the following recurrence. $a_n = 6a_{n-1} - 9a_{n-2}$, $a_0 = 0$, $a_1 = 1$.
2. (10 points) Solve the following recurrence. $a_n = 3a_{n-1} + 2n + 1$, $a_0 = 0$.
3. (10 points) A gambler repeatedly plays a game against a casino, until one of them runs out of money. Each time, the gambler has probability s of nothing happening, probability p of winning \$1, and probability q of losing \$1, with $s + p + q = 1$. The gambler starts with n dollars, and the casino with $m - n$ dollars. What is the probability that the gambler will run out of money before the casino?
4. (10 points) Solve the following recurrence. $a_n = a_{n-1} + a_{n-2} - a_{n-3} + 2$, $a_0 = 4$, $a_1 = 0$, $a_2 = 5$.
5. (12 points) Let a_n represent the maximum number of regions we can divide the plane into with n lines. Find and solve a recurrence for a_n .