MATH 113: DISCRETE STRUCTURES
HOMEWORK 09

Due: Wedneday, February 18 at 10pm.

Problem 1. Use the binomial theorem to express 3^n as a sum of powers of two times binomial coefficients.

Problem 2 (Bonus). Give a combinatorial proof of the expression found in Problem 1.[1]

Problem 3. How many ways are there to write a **nonnegative** integer m as a sum of r **nonnegative** integer summands? (We decree that the order of the addends matters, so $4 + 0$ and $0 + 4$ are two different representations of 4 as a sum of 2 nonnegative integers.) Develop a conjecture and prove it. (Note: your solution should only include your conjecture and a proof of it, it should not include the experimentation that led to the conjecture.)

[1]Bonus problems are graded independently from the homework. You should only attempt it if you have time to spare, and you should include a solution only if you are convinced it is correct.