Fall 2024 Math 189 Homework 8

Randall Holmes

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1. The sequnce 1,3,17,61,153,311... is defined by a polynomial of degree low enough that the method of differences will detect it correctly with the number of terms I have given. Indexing starts at 0. Find the closed form using both methods I have taught, Levin's method with simultaneous equations and my method using binomial coefficients.

2. Levin section 2.3 problem 12

3. Find the solution to the recurrence relation $a_{n+2} = -a_{n+1} + 6a_n$ with initial values $a_0 = 1, a_1 = 3$.

4. Levin section 2.4 problem 11

5. Prove by mathematical induction that for each natural number n, $n^3 + 5n$ is divisible by 3.

6. Prove by mathematical induction that the sum of the first n odd natural numbers is n^2. Start by writing this as a statement in summation notation, then prove it using the recursive definition of summation.