REC6:: Induction, Series

Due:

CS1800 Discrete Structures, Summer 2025

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Recitation 7: Induction, Series (2)

Problem 1 Problem 1 Multiple of 4

Prove by induction that for all n odd positive integers $1 + 3^n$ is divisible by 4.

Problem 2 Problem 2 Fibonacci numbers properties by induction

i. $F_1 - F_2 + F_3 - F_4 + \dots + (-1)^n F_{n+1} = (-1)^n F_n + 1$

ii.
$$F_1F_2 + F_2F_3 + F_3F_4 + \dots + F_{2n-1}F_{2n} = F_{2n}^2$$

Problem 3 Problem 3 Approximation

i. Let x > -1 a real value. Prove by induction over $n \ge 0$ that $(1+x)^n \ge 1 + nx$

ii. Prove that $(\frac{n}{n+1})^n \ge \frac{1}{n+1}$ by using a particular x in the previous inequality.