Math 300 Intro Math Reasoning
Worksheet 05: Set Theory

(1) Prove by induction that

$$1 \cdot 2 + 3 \cdot 4 + \ldots + (2n-1) \cdot 2n = \frac{n(n+1)(4n-1)}{3}$$

(2) Prove or disprove:

    (1) $P(A) \cap P(B) = P(A \cap B)$.
    (2) $P(A) \cup P(B) = P(A \cup B)$

(3) Prove by induction that for every n, $2^{n+1} + 5^n$ is divisible by 3.