1. Prove that \( \sum_{k=1}^{n} (2k - 1) = n^2 \) for all \( n \in \mathbb{N} \).

2. Using the principle of mathematical induction, prove the following extensions of De Morgan’s Laws for all \( n \in \mathbb{N} \):

   (a) \( \left( \bigcup_{k=1}^{n} A_k \right)^c = \bigcap_{k=1}^{n} A_k^c \)
   (b) \( \left( \bigcap_{k=1}^{n} A_k \right)^c = \bigcup_{k=1}^{n} A_k^c \)

   Is it true that \( \bigcup_{k=1}^{\infty} A_k \) \( = \bigcap_{k=1}^{\infty} A_k^c \)? Can you use induction here?

3. Prove Bernoulli’s Inequality: If \( x > -1 \), then \( (1 + x)^m \geq 1 + mx \) for all \( m \in \mathbb{N} \).

4. Page 18: Exercise 1.3.4, Exercise 1.3.5(a), Exercise 1.3.6 (over \( \mathbb{Q} \)), Exercise 1.3.9(a)(b)(c).