1. Use induction to prove that $1(2) + 2(3) + 3(4) + \dots + n(n+1) = \frac{n(n+1)(n+2)}{3}$ for every positive integer n.

2. Use induction to prove that $4|(5^n - 1)$ for every nonnegative integer n.

3. Prove that $2^n > n^3$ for every integer $n \ge 10$.

4. Define the recursive sequence

$$a_1 = 1, a_2 = 3$$
 and $a_n = 2a_{n-1} - a_{n-2}$ for $n \ge 3$.

Use strong induction to prove that $a_n = 2n - 1$ for all $n \in \mathbb{N}$.