1. Show by mathematical induction that if $h > -1$, then $1 + nh \leq (1 + h)^n$ for all nonnegative integers $n$.

2. Use mathematical induction to show that $n^2 - 1$ is divisible by 8 whenever $n$ is an odd positive integer.

3. Use mathematical induction to show that 21 divides $4^{n+1} + 5^{2n-1}$ whenever $n$ is a positive integer.

4. The Fibonacci numbers, $f_0, f_1, \ldots$, are defined by the equations $f_0 = 0$, $f_1 = 1$, and $f_n = f_{n-1} + f_{n-2}$ for $n = 2, 3, 4, \ldots$. Show that $f_{n+1}f_{n-1} - f_n^2 = (-1)^n$ whenever $n$ is a positive integer.