True or false. If a statement is a false, give an example to show that it’s false.

1. If $A$ and $B$ are infinite sets, then $|A| = |B|$.

   This is false. We saw in class that the Cantor diagonalization argument shows that $|\mathbb{Z}^+| < |\mathbb{R}|$.

2. If $A$ is a proper subset of $B$, then $|A| < |B|$.

   This is false. $\mathbb{Z}^+ \subset \mathbb{N}$, but we saw in class that $|\mathbb{Z}^+| = |\mathbb{N}|$.

3. If $A$ is a finite set and $A$ is a proper subset of $B$, then $|A| < |B|$.

   This is true. Suppose $A \subset B$, and $|A| = n$, where $n$ is nonnegative integer. Since $A \subset B$, $B - A$ is nonempty. If $B - A$ is finite, and it has $m > 0$ elements, then $|B| = n + m > n = |A|$. If $B - A$ is infinite, then $B$ is infinite, and $|B| > |A|$, since $A$ is finite.