1) Let \( f : \mathbb{R} \to \mathbb{R} \) be a continuous function. A real number \( y \) is called an extremal value of \( f \) if there exists a point \( x_0 \) such that \( f(x_0) = y \) and \( x_0 \) is a point of local maximum or minimum of \( f \). Prove that the set of extremal values of \( f \) is countable.

2) Prove that for any polynomial \( P \) with integer coefficients, there exists a positive integer \( k \) such that \( P(k) \) is not prime.

3) Define a set to be self-referenced if its number of elements is its element. For instance, \( \{1, 3, 4\} \) is self-referenced and \( \{1, 2, 4\} \) is not. Find the number of subsets of \( \{1, 2, \ldots, n\} \) that are minimal self-referenced sets, which means that they are self-referenced and do not have any smaller self-referenced subset.

4) Show that there is an infinite number of powers of two which start by the digit 9.

5) Which of the two polynomials,
\[
P(x) = (1 + x^2 - x^3)^{1000}, \quad Q(x) = (1 - x^2 + x^3)^{1000},
\]
has larger coefficient at \( x^{400} \)?