(1) Compute $\sqrt{5}$ up to 2 decimal points without using a calculator.
(2) Prove that any interval $(a, b)$ with $a < b$ contains an irrational number.
(3) Prove that if $\lim_{n \to \infty} x_n = x$ and $\lim_{n \to \infty} y_n = y$ then $\lim_{n \to \infty} (x_n + y_n) = x + y$.
(4) Let $m$ be an integer such that $(m, 10) = 1$. Let $x = \frac{n}{m}$ where $n$ is any integer.
   Prove that the period of the decimal expression of $x$ is no longer than $\phi(m)$.  