1 Problems

Putnam 2011/B1. Let $h$ and $k$ be positive integers. Prove that for every $\epsilon > 0$, there are positive integers $m$ and $n$ such that

$$\epsilon < |h\sqrt{m} - k\sqrt{n}| < 2\epsilon.$$

Putnam 2011/B2. Let $S$ be the set of all ordered triples $(p, q, r)$ of prime numbers for which at least one rational number $x$ satisfies $px^2 + qx + r = 0$. Which primes appear in seven or more elements of $S$?

Putnam 2011/B3. Let $f$ and $g$ be (real-valued) functions defined on an open interval containing 0, with $g$ nonzero and continuous at 0. If $fg$ and $f/g$ are differentiable at 0, must $f$ be differentiable at 0?