Hungary-Israel Binational 1995

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by April

1 Let the sum of the first n primes be denoted by S_n. Prove that for any positive integer n, there exists a perfect square between S_n and S_{n+1}.

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2 Let P_1, P_2, P_3, P_4 be five distinct points on a circle. The distance of P from the line P_iP_k is denoted by d_{ik}. Prove that $d_{12}d_{34} = d_{13}d_{24}$.

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3 The polynomial $f(x) = ax^2+bx+c$ has real coefficients and satisfies $|f(x)| \leq 1$ for all $x \in [0, 1]$. Find the maximal value of $|a| + |b| + |c|$.

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4 Consider a convex polyhedron whose faces are triangles. Prove that it is possible to color its edges by either red or blue, in a way that the following property is satisfied: one can travel from any vertex to any other vertex while passing only along red edges, and can also do this while passing only along blue edges.
