Kurschak Competition 1973

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by parmenides51

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1   For what positive integers n, k (with $k < n$) are the binomial coefficients

$$\binom{n}{k-1} \ , \ \binom{n}{k} \ , \ \binom{n}{k+1}$$

three successive terms of an arithmetic progression?

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2   For any positive real r, let $d(r)$ be the distance of the nearest lattice point from the circle center the origin and radius r. Show that $d(r)$ tends to zero as r tends to infinity.

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3 $n > 4$ planes are in general position (so every 3 planes have just one common point, and no point belongs to more than 3 planes). Show that there are at least $\frac{2n-3}{4}$ tetrahedra among the regions formed by the planes.