Требование к зачету

Для зачета по этому заданию нужно решить как минимум 2 задачи.

1. Let $\boldsymbol{x}_1, \ldots, \boldsymbol{x}_n$ be independent, not necessarily identically distributed, random variables satisfying $\mathbf{E}[\boldsymbol{x}_i] = \mathbf{E}[\boldsymbol{x}_i^3] = 0$. (This holds if, e.g., each $-\boldsymbol{x}_i$ has the same distribution as $\boldsymbol{x}_i$.) Assume also that each $\boldsymbol{x}_i$ is B-reasonable. Let $\boldsymbol{f} = F(\boldsymbol{x}_1, \ldots, \boldsymbol{x}_n)$, where F is a multilinear polynomial of degree at most k. Then $\boldsymbol{f}$ is $\max(B, 9)^k$-reasonable.

2. Let $\boldsymbol{x}_1, \ldots, \boldsymbol{x}_n$ be independent uniform ± 1 bits and let $a_1, \ldots, a_n \in \mathbb{R}$. Show that $a_1\boldsymbol{x}_1 + \cdots + a_n\boldsymbol{x}_n$ is a 3-reasonable random variable.

3. Show that the KKL Theorem fails for functions $f : \{-1, 1\}^n \to [-1, 1]$, even under the assumption $\mathbf{Var}[f] \geq \Omega(1)$.