UNIVERSITY OF UTAH

MATH CONTEST

PSET 2 SPRING 2024

Problem 1

Let $\{a_n\}_{n=1}^{\infty}$ be a sequence in $\mathbb{R}$. If $\{a_n\}$ has the property

$$\lim_{n\to\infty} \frac{a_1^2 + a_2^2 + a_3^2 + \ldots + a_n^2}{n} = 0$$

Show that

$$\lim_{n\to\infty} \frac{a_1 + a_2 + a_3 + \ldots + a_n}{n} = 0$$

Is the above statement an if and only if?

Problem 2

Solve.

$$\lim_{k\to\infty} \sum_{n=1}^{k} \left(\frac{n}{k^2}\right)^{\frac{n}{k^2}+1}$$

Problem 3

What is the biggest circle you can fit inside of a cube?