

1. Let (a_n) be a sequence of real numbers. Prove/Disprove:
 - (a) If $\sum_{n=1}^{\infty} a_n$ converges, then $\sum_{n=1}^{\infty} a_n^2$ converges.
 - (b) If $\sum_{n=1}^{\infty} |a_n|$ converges, then $\sum_{n=1}^{\infty} |a_n^2|$ converges.
 - (c) If $\sum_{n=1}^{\infty} a_n^2$ converges, then $\sum_{n=1}^{\infty} a_n$ converges.
2. Assume $\sum_{n=1}^{\infty} \frac{1}{n^2} = S$. Find $\sum_{n=1}^{\infty} \frac{1}{(2n+1)^2}$.
3. (a) Assume a_n is a monotonically decreasing sequence. Prove that if $\sum_{n=1}^{\infty} a_n$ converges, then $na_n \rightarrow 0$.
(b) Is it true that in general, if $a_n \geq 0$ for all $n \in \mathbb{N}$ and $\sum_{n=1}^{\infty} a_n$ converges, then $na_n \rightarrow 0$?