

1. Let $1 < p < \infty$ and $\varphi : [0, 1] \rightarrow \mathbb{F}$ be a continuous function. Consider

$$x_n = \frac{1}{n^{\frac{1}{p}}} \left(\varphi\left(\frac{1}{n}\right), \varphi\left(\frac{2}{n}\right), \dots, \varphi\left(\frac{n}{n}\right), 0, 0, \dots \right) \in \ell^p.$$

Prove that $x_n \xrightarrow{w} 0$, and (x_n) is strongly convergent if and only if $\varphi = 0$.