

MMAT5010 Linear Analysis (2024-25): Homework 8

Deadline: 12 April 2025

Important Notice:

- ♣ The answer paper must be submitted before the deadline.
- ♠ The answer paper MUST BE sent to the CU Blackboard.

1. Suppose that the finite sequences space c_{00} is endowed with the sup-norm. For each $n = 1, 2, \dots$, define $T_n : c_{00} \rightarrow c_{00}$ by

$$T_n(x)(k) := \begin{cases} kx(k) & \text{as } 1 \leq k \leq n \\ 0 & \text{as } k > n. \end{cases}$$

for $x \in c_{00}$ and $k = 1, 2, \dots$.

- (a) Show that each T_n is bounded.
- (b) Show that $T(x) := \lim_n T_n(x)$ exists for all $x \in c_{00}$.
- (c) Show that T is unbounded.

***** End *****