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HF1

$S \quad \ell^2 \to \ell^2$

$Sx = S(x_1, x_2 \dots) = \left(x_1, \frac{1}{5}x_2, \frac{2}{7}x_3 \dots \frac{n-1}{2n+1}x_n \dots\right)$

$Sx = \lambda x \Rightarrow$ true for $\forall \lambda = \frac{n-1}{2n+1}$

$\lambda_n = \frac{n-1}{2n+1}$ is bounded $\Rightarrow |\lambda_n| \leq \frac{1}{2}$.

because $\lim_{n \to \infty} \frac{n-1}{2n+1} = \frac{1}{2}$

The spectrum eigenvalues $\cup$ bound.

$\Downarrow$

$\sigma(S) = \left\{\frac{n-1}{2n+1} \mid n \in \mathbb{N}\right\} \cup \left\{\frac{1}{2}\right\}$

HF2

$X = C[0,1]$

$T \in B(X) \quad (Tf)(x) = x^2 f(x)$

T is invertible, the inverse is $(T^{-1}f)(x) = \frac{1}{x^2} f(x)$

$\Downarrow$

$x \neq 0$

$\sigma(T) = \{x^2 \mid x \in (0,1]\}$