Homework 2, Spring 2023:

Problem 2.1:
Compute

$$\left(\frac{1}{\pi}\text{p.v.}\frac{1}{x}\right)^{\wedge}(\xi) = -i\text{sgn}(\xi)$$

in the sense of tempered distribution where $\text{sgn}(\xi) = 1$, if $x > 0$; $= 0$, if $x = 0$; $= -1$, if $x < 0$.

Problem 2.2:
If $f = 1_{[0,1]}$, show that $Hf \notin L^1$ and $Hf \notin L^\infty$.