

FOURIER ANALYSIS / week 11

① Recall the definitions of the distributions $PV(\frac{1}{x})$ and x^{-2} . Prove that

$$\frac{d}{dx} PV\left(\frac{1}{x}\right) = -x^{-2}$$

in the sense of distributions.

② Verify that

$$\Delta\left(\frac{1}{r}\right) = -c\delta, \quad r = \sqrt{x_1^2 + x_2^2 + x_3^2}$$

in the sense of distributions. Determine the constant c . (As usual, $\delta = \text{Dirac's delta}$)

③ Verify

$$\widehat{f(ax-b)} = e^{-\frac{wb_i}{a}} \frac{1}{|a|} \widehat{f}\left(\frac{\omega}{a}\right) \quad a \neq 0.$$

Then $\widehat{f(2ix-k)} = ?$

Chapter 5 / 12 p. 232

Chapter 4 / 1 p. 187