

# INFINITESIMAL FOURIER TRANSFORMATION FOR THE SPACE OF FUNCTIONALS

TAKASHI NITTA

Topic #4: *Nonstandard Methods in Functional Analysis.*

[Joint work with and Tomoko Okada.<sup>1</sup>]

A functional is a function from the space of functions to a number field, for example,  $f : \{a : (-\infty, \infty) \rightarrow (-\infty, \infty)\} \rightarrow (-\infty, \infty)$ . These three  $\infty$ 's are written as the same notation, but these original meanings are quite different. The purpose of this proceeding is to formulate a Fourier transformation for the space of functionals, as an infinitesimal meaning. For it we divide three  $\infty$ 's to three types of infinities. We extend  $\mathbf{R}$  to  $^*(\mathbf{R})$  under the base of nonstandard methods for the construction. The domain of a functional is the set of all internal functions from a  $^*$ -finite lattice to a  $^*$ -finite lattice with a double meaning. Considering a  $^*$ -finite lattice with a double meaning, we find how to treat the domain for a functional in our theory of Fourier transformation, and calculate two typical examples.

DEPARTMENT OF EDUCATION, MIE UNIVERSITY, KAMIHAMA, JAPAN  
*E-mail address:* `nitta@edu.mie-u.ac.jp`

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<sup>1</sup> Division of General Education, Aichigakuin University, Nisshin, Japan. E-mail: `m98122c@math.nagoya-u.ac.jp`.