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ABSTRACTS OF DOCTORIAL DISSERTATION

Some Topics in Harmonic Analysis on a Class of Homogeneous Groups, Sun Limin (孙利民) Hangzhou University, **Supervisor:** Wang Silei (王斯雷), **Approved,** 1989, 5.

The thesis consisting of four chapters is devoted to study the harmonic analysis on a special class of homogeneous groups $N(\Phi)$.

In chapter 1, we discuss the structure of $N(\Phi)$, and derive out its unitary dual, coadjoint orbit picture, Plancherel measure and the corresponding irreducible unitary representations.

In chapter 2, we view harmonic analysis on $N(\Phi)$ as the spectral theory of its sub-Laplacian $\mathscr{L}$. Some basic eigenfunctions are determined. It turns out that square integrable functions on $N(\Phi)$ can be represented by these eigenfunctions. Moreover, a kind of Plancherel formular is established.

In chapter 3, some basic results about the group Fourier transform on $N(\Phi)$ are obtained. Combining this and the Fourier transform on Euclidean space, we consider the singular integral characterization of the Hardy space $H^1(N(\Phi))$. A group-representation theoretic criterion is established.

In the last chapter, we investigate Hilbert integral on Siegel domains of type II by using the results of singular integral on $N(\Phi)$. The L^p-boundness of some Hilberl integrals is proved.

Mathematics in the Calculation of the Ancient Chinese Calendar, Wahg Yusheng (王渝生), Institute of History of Natural Science, Academic Sinica, **Supervisor:** Yan Dunjie (严敦杰), **Approved:** 1987, 7.

By investigating documents and analysing mathematical principles in the direction of history of mathematics, this paper discusses the historical development of methods of deducing the *Shangyuan Jinian* (上元积年推算), adjusting the *Rifa* (调日法), deducing the *Xiandu* of the sun, the moon and five planets (日月五星行度推算), and expounds the sources and development of linear congruences, approximate calculation of fractions, finite difference and interpolation. Comparing these contents to those of the foreign countries, this paper makes a high assessment of distinctive features and outstanding achievements of the ancient Chinese mathematical astronomy in algorithmication, algebraization, programmatication and mechanization, and points out the important referential value of them

in the development of modern mathematics.

The Equations of Gross Determinism Corresponding to Eighteen Gross Moments and the Method of Stretched Fields, Song Jinbao (宋金宝), Inner Mongolia University, **Supervisor**: Chen Tianquan (陈天权), **Approved**: 1989, 1.

This paper contains two parts. Part one is limited to Maxwellian molecules. The generalized equations of gross determinism corresponding to eighteen moments are given in the first parts. By extending the method of stretched fields to the new gross determiners which staisfy the generalized equations, we obtained approximate expressions of these new gross determiners. In part two, we shown that the method developed in part one and main conclusions obtained for Maxwellian molecules still hold for non-Maxwellian molecules under general conditions.

The Foundation of Quantum Detection and Estimation Theory, Qin Qianqing (秦前清), Nankai University, **Supervisor**: Shen Shiyi (沈世镒), **Approved**: 1989, 7.

A theory of Quantum Detection and Estimation is set up in the following for operators associated with an Σ-algebra of operators on a Hilbert space. It is proved that the classical theory of Statistical Detection and Estimation over abstract measure space is for the most part equivalent to the special case of our theory in which the Σ-algebra is commutative. It is shown that the Radon-Nikodym theorem still works while the Lebesgue decomposition theorem holds only for the pair of well behaved density operators the Jenson Inequality is still valid for ε-conditional Expectations but the Factor decomposition theorem is true only for sufficient Σ-algebras. We prove the generalization of the C-R Inequality and the Neyman-Pearson Lemma in certain conditions. We find the relationship between entropy and Fisher's information and the relationship entropy and ε-sufficient Σ-algebra in some cases. As an application, the entropy of a stationary Quantum Process is obtained.