

ABSTRACT**CONSTRUCTION OF GEL'FAND TRIPLETS FOR VARIOUS QUANTUM SYSTEMS**

Onur GENÇ

M.Sc. Thesis, Department of Physics
Supervisor: Assist. Prof. Dr. Haydar UNCU
2013, 45 pages

The mathematical structure of quantum mechanics depends on matrices and differential operators. The space which these operators act on is chosen as Hilbert space usually. However, the Hilbert space cannot provide the necessary mathematical structure which is needed to define the Dirac formulation and Dirac's δ -function used in quantum mechanics generally. In 1964 I. M Gelfand and N. Ya. Vilenkin invented the Gel'fand triplets by developing the distribution theory developed by L. Schwartz in order to create the mathematical structure of Dirac formulation and Dirac's δ -function.

In this thesis, it has been represented that Gel'fand triplets of various quantum mechanical systems can be achieved by using the factorization method which is used by H. S. Green to determine the spectrum and eigenvectors of quantum mechanical operators. For example, the Gel'fand triplets of harmonic oscillator and infinite potential well has been achieved. Besides that, the fact that the inconsistency that arises during the calculation of energy squared and uncertainty when the Hilbert space is chosen as vector space can be removed if Gel'fand triplets are chosen.

Key Words

Topology, bounded operator, dual space, spectrum, dense space, Cauchy sequence.