Abstract

Various properties of Hilbert space operators have been studied over many decades and these operators include normal operators, hyponormal operators, transloid operators and convexoid operators among others. Important results have been obtained regarding numerical range of operators as well as spectrum of operators. However, little has been done on the numerical range and spectra of convexoid operators, particularly the relationship between them. In this study we determine the numerical range of convexoid operators, we determine the spectrum of convexoid operators as well as to establish the relationship between numerical range and spectrum of these convexoid operators. To achieve this we involved the use of known inequalities like Cauchy-Schwarz inequality, Minkowski's inequality, pythagorean identity, parallelogram law and Cauchy- Bunyakovsky-Schwarz inequality as well as the technical approaches of tensor products, inner products and polarization identity to investigate numerical ranges and spectra of convexoid operators. The results show that numerical range of convexoid operator is a closed disc and the algebraic numerical range is contained in the closure of the numerical range. Moreover, the spectrum of the tensor product of convexoid operators are contained in the numerical range of the tensor product of the same convexoid operators. These results are applicable to quantum mechanics and probability theory. In addition, fundamental equation of quantum mechanics involves unitary and self adjoint operators. Furthermore, investigation of the relationship between numerical range and spectra would be applicable to other classes of Hilbert space operators.