

Answer on Question #68641, Physics / Quantum Mechanics |

Question

if A^\wedge and B^\wedge are hermitian and anti-hermitian operators respectively. check the hermiticity of the commutator $[A^\wedge, B^\wedge]$ of the two operators .

Solution

We have

$A^\wedge = A^\wedge$ — hermitian operator,

$B^\wedge = -B^\wedge$ — anti-hermitian operator.

We remind the definition of the comutator

$$[A^\wedge, B^\wedge] = A^\wedge B^\wedge - B^\wedge A^\wedge$$

and the property of hermitian conjugation

$$(A^\wedge B^\wedge)^\dagger = B^\dagger A^\dagger.$$

Now we can check the hermiticity of the commutator

$$[A^\wedge, B^\wedge]^\dagger = (A^\wedge B^\wedge - B^\wedge A^\wedge)^\dagger = (A^\wedge B^\wedge)^\dagger - (B^\wedge A^\wedge)^\dagger = B^\dagger A^\dagger - A^\dagger B^\dagger = -B^\wedge A^\wedge + A^\wedge B^\wedge = [A^\wedge, B^\wedge].$$

Thus, commutator $[A^\wedge, B^\wedge]$ is hermitian.

Answer: commutator $[A^\wedge, B^\wedge]$ is hermitian.

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