

COMMUTATOR OF TWO HERMITIAN OPERATORS

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Reference: Tom Lancaster and Stephen J. Blundell, *Quantum Field Theory for the Gifted Amateur*, (Oxford University Press, 2014), Problem 5.3.

Post date: 7 Mar 2019.

The commutator of two hermitian operators is anti-hermitian, as we can see by direct calculation.

$$[A, B] = AB - BA \quad (1)$$

$$[A, B]^\dagger = (AB - BA)^\dagger \quad (2)$$

$$= (AB)^\dagger - (BA)^\dagger \quad (3)$$

$$= B^\dagger A^\dagger - A^\dagger B^\dagger \quad (4)$$

$$= BA - AB \quad (5)$$

$$= -[A, B] \quad (6)$$

In the penultimate line, we used the hermitian property $A^\dagger = A$, $B^\dagger = B$.