Quantum Mechanics: A Brief Overview

From *Quantum Mechanics* by David J. Griffiths

and *Quantum Mechanics* by B.H. Bransden & C.J. Joachain

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Chapter 1

Formalism

Before discussing the formalism of quantum mechanics, we shall provide a brief review of linear algebra.

A vector is an N-tuple. A vector space $\mathbb{F}^N$ is a set of vectors over the field $\mathbb{F}$. Vectors in a vector space are commutative in addition, associative in addition, and distributive with respect to a scalar. Furthermore, all vector fields by definition contain an additive identity, additive inverse, and multiplicative identity. Vectors in quantum mechanics are represented by kets,

$$|\alpha\rangle \doteq \begin{pmatrix} a_1 \\ a_2 \\ \vdots \\ a_N \end{pmatrix} \tag{1.0.1}$$

Furthermore, the inner product is a function on a vector space that takes a pair of vectors to a scalar. The inner product of vector kets $|\alpha\rangle$ and $|\beta\rangle$ are denoted $\langle\alpha|\beta\rangle$ and the inner product has properties,

1. positive: $\langle\alpha|\alpha\rangle \geq 0$
2. definite: $\langle\alpha|\alpha\rangle = 0$ if and only if $|\alpha\rangle = 0$

$$\sigma_i = \pm 1 \tag{1.0.2}$$

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Appendix A

Field and Source Points