Feb 11th, 2015

Pl/2

Quantum

Guest Lectures

I. Why linear Algebra?

II. Inner product

III Hilbert Space

IV Revised Inner Product

Wave function $|\alpha\rangle$ gets rep'd by a vector

$$|\alpha\rangle \rightarrow a = \begin{pmatrix} a_1 \\ a_2 \\ \vdots \\ a_N \end{pmatrix}$$

In the Dirac notation we have $|\beta\rangle = T|\alpha\rangle$ and it gets rep'd by

$$\vec{b} = T\vec{a} = \begin{pmatrix} t_{11} & t_{12} & \cdots \\ t_{21} & \vdots & \\ \vdots & \vdots & \end{pmatrix} \vec{a}$$

To complete our definition of a Hilbert space, we include a notion of an inner product,

$$\langle\alpha|\beta\rangle = a_1^* b_1 + a_2^* b_2 + \cdots + a_n^* b_n$$

What is the set of functions that we are interested in?

We are interested in all the square integrable functions on a specified range.

Hilbert Space, this is a space of functions that forms a vector space.

Inner products:

$$\langle \alpha | \beta \rangle = \sum_{n=1}^{\infty} a_n^* b_n$$

$$\langle f | g \rangle = \int_a^b f^*(x) g(x) dx$$

Note that

$$\langle g | f \rangle = \langle f | g \rangle^*$$

A set of functions is orthonormal if they are orthogonal one to another and each is normalized.