Quantum Mechanics : PHYS 311

Attempting to write a study guide for midterm

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Contents

Methodology

Reading this handout

What I am going to do is that

- Read the lectures from the first day.

- Read the example solved problems in problem session.

- Find out some relevant problems from outside sources that are in context, and then type their solution up.

Problem 1 This is a problem statement.

Solution This is a solution statement.

Definition 1 This is a definition.

Fact 1 This is a fact. By fact I mean it's a derivative of Definition.

$$\cos\theta = 1 - \frac{1}{2!}x^2 + \frac{1}{4!}x^4 - \cdots$$

$$\sin\theta = x - \frac{1}{3!}x^3 + \frac{1}{5!}x^5 - \cdots$$

$$\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} \cos\theta = 1 - \frac{1}{2!}x^2 + \frac{1}{4!}x^4 - \cdots & -\sin\theta = -x + \frac{1}{3!}x^3 - \frac{1}{5!}x^5 + \cdots & 0 \\ \sin\theta = x - \frac{1}{3!}x^3 + \frac{1}{5!}x^5 - \cdots & \cos\theta = 1 - \frac{1}{2!}x^2 + \frac{1}{4!}x^4 - \cdots & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \text{ roughly speaking } \sum x^n/n! \begin{bmatrix} 1,0,-1,0,1,\ldots & 0,-1,0,1,0\ldots & 0 \\ 0,1,0,-1,0,1\ldots & 1,0,-1,0,1\ldots & \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} + x\begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} + \frac{x^2}{2!}\begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 0 \end{bmatrix} + \frac{x^3}{3!}\begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} + \cdots$$

$$= \hat{I} + xG_3 + \frac{x^2}{2!}G_3^2 + \frac{x^3}{3!}G_3^3 + \cdots = e^{\theta G_3}$$

Lecture 17