

Quantum Mechanics C (130C) Winter 2015 Midterm exam front page

Thursday, February 19, 2015, 11am-12:20pm

Please remember to put your name on your exam booklet. This is a closed-book exam. There are 4 problems, each with several parts, of varying levels of difficulty; make sure you try all of the parts as there are many opportunities for partial credit. None of the problems require very extensive calculation; if you find yourself involved in a morass of calculation, step back and think. Good luck.

Possibly useful information:

$$\boldsymbol{\sigma}^x = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}, \quad \boldsymbol{\sigma}^y = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}, \quad \boldsymbol{\sigma}^z = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$

$$|\uparrow_{\check{n}}\rangle = e^{-i\varphi/2} \cos \frac{\theta}{2} |\uparrow_z\rangle + e^{+i\varphi/2} \sin \frac{\theta}{2} |\downarrow_z\rangle \quad \text{satisfies} \quad \vec{\sigma} \cdot \check{n} |\uparrow_{\check{n}}\rangle = |\uparrow_{\check{n}}\rangle$$

$$e^{-i\alpha\check{n}\cdot\vec{\sigma}} = \mathbb{1} \cos \alpha - i\check{n} \cdot \vec{\sigma} \sin \alpha.$$