Problem Set 6

Physics 442
Quantum Mechanics II

Due on Friday, March 22nd, 2024

Problem 1

Use the Feynman-Hellman theorem to find the first order corrections to the energies associated with the Hamiltonian $\hat{H}^0 + \lambda \hat{H}^1$.

Problem 2

Griffiths & Schroeter Problem 7.43.

Problem 3

Griffiths & Schroeter Problem 7.44 – in part a., just do $s = 0$ and $s = 1$.

Problem 4

Using the hydrogenic $|n\ell m\rangle$ and $|\uparrow\rangle$, $|\downarrow\rangle$ for the electron's spin state, construct the state with total angular momentum $J = 1/2$, with z-component $M = -1/2$ using $\ell = 1$ states (you'll need to make products of $|n\ell m\rangle$ and the electron spin states).

Problem 5

Griffiths & Schroeter Problem 7.25.