Physics 632 WI 07 Exam #2 Notes

1d well $V(x) = 0$, $0 \le x \le a$ and $V(x) = \infty$ outside

$$\phi_n(x) = \sqrt{\frac{2}{a}} \sin\left(\frac{n\pi x}{a}\right), \quad n = 1, 2, \ldots$$

$$E_n = n^2 E_0 \quad \text{where} \quad E_0 = \frac{\pi^2}{2ma^2}$$

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angular momentum $\vec{J}$

$$J^2 |jm\rangle = j(j+1)|jm\rangle \quad ; \quad J_z |jm\rangle = m|jm\rangle$$

$$J_\pm = J_x \pm i J_y \quad ; \quad J_\pm |jm\rangle = \sqrt{j(j+1) - m(m\pm1)}\,|j, m\pm1\rangle$$

Perturbation theory $H = H_0 + H'$

$$H_0 |\psi_n^{(0)}\rangle = E_n^{(0)} |\psi_n^{(0)}\rangle$$

$$H|\psi_n\rangle = E|\psi_n\rangle$$

$$E_n = E_n^{(0)} + E_n^{(1)} + E_n^{(2)} + \cdots \quad ; \quad |\psi_n\rangle = |\psi_n^{(0)}\rangle + |\psi_n^{(1)}\rangle + \cdots$$

$$E_n^{(1)} = \langle \psi_n^{(0)} | H' | \psi_n^{(0)} \rangle$$

$$E_n^{(2)} = \sum_{m \neq n} \frac{|\langle \psi_n^{(0)} | H' | \psi_m^{(0)} \rangle|^2}{E_n^{(0)} - E_m^{(0)}}$$