

PHYS 4310, Homework 5 due on October 7th, 2015

Griffiths (2nd edition): 4.1 (15 points), 4.2 [only parts (a) and (b)](18 points), 4.3 (12 points), 4.6 (18 points), and 4.9 (15 points)

Answer for part (a) of 4.2: $\psi(x, y, z) = \left(\frac{2}{a}\right)^{3/2} \sin\left(\frac{n_x\pi}{a}x\right) \sin\left(\frac{n_y\pi}{a}y\right) \sin\left(\frac{n_z\pi}{a}z\right)$ and $E = \frac{\hbar^2 \pi^2}{2m a^2} (n_x^2 + n_y^2 + n_z^2)$.

Partial answer for 4.9: After solving the wavefunction by using continuity at $r = a$, you should obtain $-\cot z = \sqrt{\left(\frac{z_0}{z}\right)^2 - 1}$, where $z \equiv ka$, $k = \frac{\sqrt{2m(E+V_0)}}{\hbar}$, and $z_0 \equiv \frac{\sqrt{2mV_0}}{\hbar}a$. From there, you can find the condition for having no bound state.