Phys 735: Homework I

1. *[6 pts]*
Show that the general solution of the free, time-independent Schrödinger equation

$$H_0|\Psi\rangle = E|\Psi\rangle \tag{1}$$

with $E = \hbar^2 k^2/(2m) > 0$ can be written as

$$\Psi_k(\mathbf{r}) = \sum_{l=0}^{\infty} \sum_{m=-l}^{l} C_{lm} j_l(kr) Y_{lm}(\theta, \varphi) \tag{2}$$

Determine the coefficients C_{lm}.