

Tarefa 19: two-band system (Dirac-Weyl).

Consider the Hamiltonian of the form:

$$H(\mathbf{k}) = \mathbf{k} \cdot \boldsymbol{\sigma} \quad H(k_x, k_y, k_z) = \begin{pmatrix} k_z & k_x - ik_y \\ k_x + ik_y & -k_z \end{pmatrix}$$

1) Calculate the eigenvalues of $H(\mathbf{k})$

2) Calculate the eigenvectors (up to a phase) in terms of the angles θ and ϕ :

$$k_z = |\mathbf{k}| \cos \theta$$

$$k_x + ik_y = |\mathbf{k}| \sin \theta e^{+i\phi}$$