

Tarefa 17: Landau gauge.

Hamiltonian (2D electron in a magnetic field): $\left[\frac{1}{2m^*} (\mathbf{p} + e\mathbf{A})^2 \right] \Psi(\mathbf{r}) = E\Psi(\mathbf{r})$

Choice: **Landau gauge.** $\mathbf{A} = Bx\hat{\mathbf{y}}$

- 1) Show that this gauge choice also gives $\mathbf{B} = B\hat{\mathbf{z}}$
- 2) Show that the energy levels of the resulting Hamiltonian are also Landau levels.
 - 2.1) Write the Hamiltonian H and show that it commutes with one of the momenta.
 - 2.2) Show that H can be written as a Harmonic oscillator.