Aufgabe 1) Bravais Lattice

Show that the Graphene (2d-honeycomb) lattice is not a Bravais lattice and find the corresponding basis with translations. How many atoms in unit cell has the Buckyball (Fulleren) superconductor \( \text{K}_3\text{C}_{60} \) with the FCC lattice.

Aufgabe 2) Wigner-Seitz-Cell

Proof that volume of the Wigner-Seitz cell multiplied with volume of the Brillouine zone in 3 dimension is equal to \((2\pi)^3\).

Aufgabe 3) Plane-wave basis

Proof that for any reciprocal vectors \( \vec{G} \) and \( \vec{G}' \)

\[
\frac{1}{V} \int_V d^3r e^{-i\vec{G}\cdot\vec{r}} e^{i\vec{G}'\cdot\vec{r}} = \delta_{\vec{G}\vec{G}'}
\]