

Physics 617 Problem Set 3 Due Friday, Sept. 21

(1) Kaxiras 2.8

(2) Kaxiras 2.9

(3) Kaxiras 3.1

(4) Kaxiras 3.2

(5) Consider a 2-dimensional honeycomb lattice, with distance a between atoms. As you recall, this is a lattice with a two-atom basis.

(a) Find the dimensions of the real-space primitive cell, and the primitive cell in reciprocal space, for this lattice.

(b) Draw (carefully, use a ruler [or computer]) the reciprocal lattice for this structure, and construct the first 5 Brillouin zones.

(c) For the case of two electrons per atom in this structure (not per cell), find k_f assuming free electrons, and plot the Fermi surface (Fermi circle) on your drawing.

(d) Sketch the reduced-zone connected pieces of this Fermi surface, similar to what is done in fig. 3.6 for the square lattice.