Condensed Matter Physics : Homework 1
Due: 23 January 2006


4 Omar, *Elementary Solid State Physics*, problem 7, page 32. You need to find the basis vectors for the primitive cell and show by starting at one lattice site and translating by combinations of integer multiples of these you can reach *any other* lattice site. Symmetry and algebraic vector manipulations are helpful.

5 Planes in a simple cubic lattice
Consider a simple cubic lattice whose primitive cell has sides of length $a$.

a) Illustrate the planes with Miller indices $(011)$ and $(101)$.

b) In scattering off crystal, the density of lattice sites per plane is important. Suppose that in a lattice whose primitive cell has volume $v$ a certain parallel crystal planes are separated by distance $d$. Show that the density of lattice sites (per unit area) in the plane is $d/v$.

c) Determine the density of lattice sites for the planes with Miller indices $(122)$ and $(111)$.

d) Determine the Miller indices of the planes with the greatest density of lattice sites.