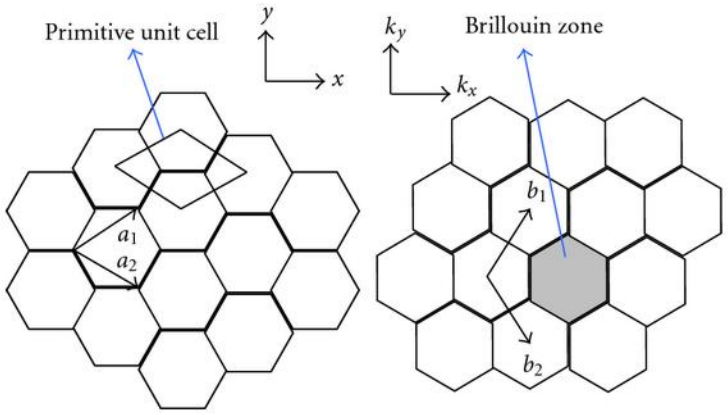
Problem 1

Tight Binding Calculations for Single and Multi Layered Graphene: Comparison with ARPES data

Single Layer Tight Binding Calculations

To begin, we start with the Brillouin Zone of Graphene, shown below.



The distance between carbon atoms in real space is $a = 0.142$ nm, therefore we can see that the primitive lattice vectors are $\mathbf{a}_1 = \frac{a}{2}(3, \sqrt{3})$ and $\mathbf{a}_2 = \frac{a}{2}(3, -\sqrt{3})$. Taking the Fourier Transform of real space, we find that the lattice vectors for the reicprocal space are $\mathbf{b}_1 = \frac{2\pi}{3a}(1, \sqrt{3})$ and $\mathbf{b}_2 = \frac{2\pi}{3a}(1, -\sqrt{3})$.