Assignment 2.1

1. Show/Proof that n(x) written as a Fourier series (equation 4) has a periodicity of a.
2. Show/Proof that the complex Fourier series given by equation (5) is only real if n_{-P} is the complex conjugated of n_P.
3. Show/Proof that the values of the constants n_P can be calculated from n(x) using equation (10).

Read the reciprocal lattice vector section on page 29 and 32 and then answer the following questions:

4. Explain why Kittel's definition of b1, b2, and b3, is the same as the following definition that is more common in literature:

$$\vec{b}_1 = 2\pi \frac{\vec{a}_2 \times \vec{a}_3}{\vec{a}_1 \bullet \vec{a}_2 \times \vec{a}_3}$$

$$\vec{b}_2 = 2\pi \frac{\vec{a}_3 \times \vec{a}_1}{\vec{a}_2 \bullet \vec{a}_3 \times \vec{a}_1}$$

$$\vec{b}_3 = 2\pi \frac{\vec{a}_1 \times \vec{a}_2}{\vec{a}_3 \bullet \vec{a}_{\grave{}} \times \vec{a}_2}$$

5. Why would we call $\mathbf{b_1}$, $\mathbf{b_2}$, and $\mathbf{b_3}$ reciprocal lattice vectors? Explain reciprocal!
6. Show/proof that the 3D electron density function n(**r**) is periodic in $\mathbf{a_1}$, $\mathbf{a_2}$, $\mathbf{a_3}$ or any linear combination of those lattice vectors.
7. Work problem 1 at the end of chapter 2.
8. Work Problem 4 at the end of chapter 2.