1. Sketch the plane and the direction vector characterized by (0\bar{1}1) and [0\bar{1}1]. Show your steps. 
2. Sketch the plane and the direction vector characterized by (112) and [112]. Show your steps. 
3. Show that the three numbers are proportional to the directional cosines of the normal of the plane.

2. (a) Derive the expression for the number of states with the magnitude of momentum in the range from \( p \) to \( p + dp \). 
   (b) How many states for electrons are there with momentum between \( 5.4 \times 10^{-25} \) kg\cdot m/s and \( 5.9 \times 10^{-25} \) kg\cdot m/s in a volume with dimensions 1cm\times 2cm\times 3cm?

3. In the homework set No. 1, you worked out the case of electrons in an isolated nanostructure (confined box by infinitely large barriers). In the case of crystalline solids, calculate the density of states for electrons in solids (in number of states per unit volume and per unit energy) for Si at energy equal to 0.5, 1, and 2 eV, assuming that the density-of-state effective mass of electrons \( m^* = 1.08 \, m_0 \) for Si. Does it depend on the size of the volume when the volume is sufficiently large? Why?

4. (Exercise of the Fermi-Dirac Distribution function.) The probability of occupation for an electronic state is 80% at 400K. What is the energy of that the state if the Fermi energy is 2eV?
5. In the text, the expression for the three dimensional density of states is derived. Derive the expression for the two dimensional density of states.

HW Collection Procedures:
1. There will be three boxes outside of room 66-147B in the 6th floor faculty/staff cubicle area of Eng. IV.
2. Write your FIRST NAME, LAST NAME, STUDENT ID and SECTION NUMBER.
3. Please put your homework in the box corresponding to your respective TA. (i.e. whose section you are attending)
4. The boxes will be removed by deadline time on deadline day and LATE HOMEWORK will NEITHER be accepted NOR credited.
5. The default deadline time is 4:00PM.
6. You can collect your HW in your discussion section or during the TA office hours.