Solid State I

Homework (#9) last homework before final examination
Due Wednesday, 14 April, 2000

1. A&M 23.2
2. A&M 25.3
3. In Silsbee and Dräger’s Debye program, the sliders for $B$, $v_s$, lattice constant, and mass control the simulation and the parameters of the Debye model.
   a. By reading chapter 5 and playing around with the program, determine which slider is relevant to which model. Describe qualitatively how each slider affects the computed dispersion curve, heat capacity, and density of states. (Be sure to select both “simulation” and “Debye.”)
   b. In Preset 7, compute the density of phonon states appropriate to copper, according to the simulation. Can you correlate the van-Hove singularities with features in the dispersion curve?
   c. By switching to “arbitrary” directions (100), (110), and (111), compare the actual sound velocities (copper-colored diamonds) to $v_s$ of Preset 7. Why (roughly) do some arbitrary directions have three phonon branches and others only two?
4. S&D 5.39