Finish reading about phonons: A & M chapters 23, 24, 25. Chap. 24 is straightforward and rather descriptive. Chap. 23 will be covered thoroughly in class. After reading pp. 464-465, read pp. 143-145, substituting $\omega_s(k)$ for $\varepsilon_n(k)$, $s^{th}$ branch for $n^{th}$ band, and removing the factor of 2 from spin degeneracy. [Thus, for phonons there is no factor of 2 in eqns. (8.53), (8.54), and (8.58), the $1/4\pi^3$ should be $1/8\pi^3$ in eqns. (8.57), (8.59), (8.60), and (8.63).] In chap. 25 we will only have time to cover lattice thermal conductivity (pp. 495-505) with any care. The rest of that chapter can be skimmed very casually. The objective should be to get a sense of what results are known. Finally, review Appendix L and study Appendix M (pp. 784-787).

Problems to turn in (read the rest):

1. 23-1 (parts a and c only)
   Hint: Use $\Sigma_\lambda\lambda_s(k) = \Sigma_\mu D_{\mu\mu}(k)$, and note that the trace is independent of the representation.
2. 23-2
3. 23-3 Hint for part b: assume $\omega(k) = \omega(k_0) - \alpha(k - k_0)^2$
4. 24-3 (parts a and b only; you can simply accept eqn. (N.17) as reasonable or read Appendix N).
5. 25-5
6. a) Find the power of $\omega$ for the phonon density of states of the Debye model in 1 and in 2 dimensions, i.e. for $g(\omega) \sim \omega^\alpha$, what is $\alpha$?
   b) Consider a dispersion relation with $\omega = \text{const times } k^m$. What is the value of $\alpha$ in 1, 2, and 3 dimensions? (E.g., $m=2$ for spin waves (magnons).)