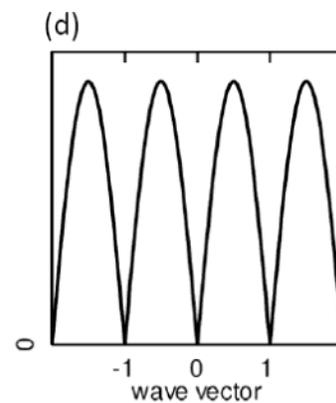
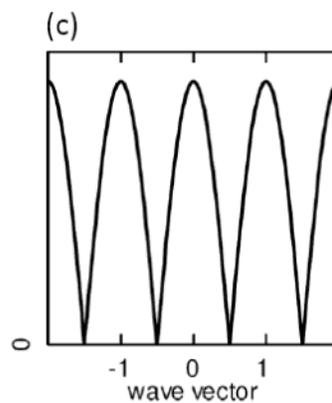
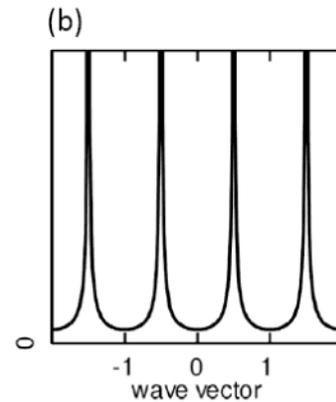
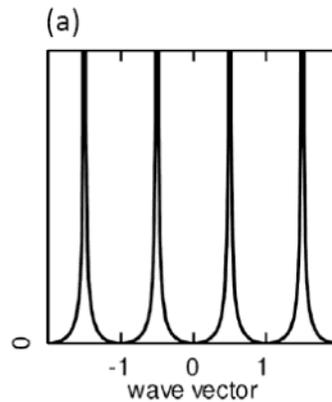
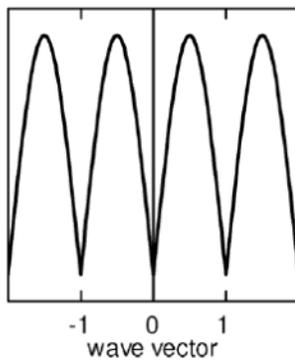


Quiz 5

Tuesday, February 23, 2010

Your name:

1. [10 points] The following figure shows a dispersion relation in a one dimensional crystal. Which one is the correct density of states for the dispersion relation? Briefly explain why.



[flip over for the 2nd problem, please]

2. [10 points] Some "manganites" $\text{La}_{1-x}\text{Ca}_x\text{MnO}_3$ become ferro-magnetic metals at low temperatures ($< 10 \text{ K}$), and show a specific heat component $\propto T^{3/2}$. Explain why this behavior is likely due to bosons (collective modes such as spin waves or phonons) rather than fermions (electrons). What is the exponent α , if we assume that the boson dispersion relation $\omega_k \propto |k|^\alpha$? What would you conclude as to the nature of the boson, phonon or spin wave?