

### HW5\_3

1. There is currently a lot of interesting research being done on Thermal Properties of materials. The new LED lighting devices produce a lot of heat that needs to be moved away from the p-n junction and also high end fast microprocessors can benefit from high conductive materials that can be successfully applied to cool devices. Other research is focused on realization of a material with a low thermal conductivity such as for example the tiles developed for the space-shuttle. Nanotechnology, i.e. low dimensional systems, are being investigated to improve upon bulk materials. Pick one of the key-words listed below and write a short essay to describe the physics of the thermal effect and a possible application of it.
  - a. Peltier effect
  - b. Seebeck effect
  
2. Calculate  $\langle x \rangle$  using equation (38) to proof equation (40) on page 120.