ECE 656: Fall 2009
Lecture 10 Homework

1) In Lecture 8, we developed a current equation for electrons in the presence of a gradient in the electrochemical potential and temperature as

$$J_{nx} = \sigma_n \frac{d\left(F_n/q\right)}{dx} + \left[SG\right]\frac{dT}{dx}$$

where

$$\sigma_n(E) = \frac{2q^2}{h}\lambda(E)\frac{M(E)}{A}\left(-\frac{\partial f_0}{\partial E}\right)$$

and

$$\left[SG\right] = +\left(\frac{k_B}{q}\right)\int \sigma_n(E)\left(\frac{E-E_F}{k_BT}\right)dE$$

1a) Assume a 3D non-degenerate n-type semiconductor with a constant mfp and evaluate the two parameters, σ_n and [SG].

1b) Give a physical explanation for the sign of [SG].