Photodetectors

1. Consider a generic intrinsic photoconductor as described in Fig. 2.2 of the text. Assuming uniform conditions, (such as the illumination, electron-hole pair generation rate, and internal fields), derive an expression for photocurrent, and show that the photoconductive gain $G$ appears naturally.

2. Using equations for the G-R noise and the responsivity, derive Eqn. (2.52) of text.

3. Based on the photodetector example (2.4) on page 53 of text, carry out the steps and show the work to determine the following parameters for operation at $\lambda = 1 \, \mu\text{m}$. (a) responsivity $S_R$; (b) photoconductive gain $G$; (c) dark resistance $R_d$; (d) Johnson noise current (rms) $I_N$ in 1 Hz noise bandwidth; (e) noise equivalent power NEP; (f) detectivity $D$; and (g) the $D^*$.

4. Problem 3.1, from Rieke, p. 76.

Homework assignments will appear on the web at:
http://www.ece.udel.edu/~kolodzey/courses/eleg867f09.html.

Note: On each homework and report submission, please give your name, the due date, assignment number and the course number.