A photodiode is connected to a load resistance, $R$, and the potential drop is sensed by a unity gain amplifier.

1. What is $V_o$ for the photocurrent $I_L$?
2. Make a noise model for the circuit, i.e., add thermal noise for "$R" and replace the photodiode with a source of shot noise current. Draw the circuit. Hint: See "Handout on Noise".
3. What is the expression for the RMS noise output, denoted $S_{V_o}$? Hint: Variances add.
4. What is the expression for the signal-to-noise ratio, denoted $S/N$?
5. Plot $\log (S/N)$ vs $\log (I_p)$. What happens near $I_p = \frac{2.5kT}{e}$?

In addition, complete problems 1-3 in the handout "Notes on an Op-Amp Differentiator Circuit"