**Homework 1, due February 2, 2011**

1. HH Exercise 6.2.

2. Derive the three equations in HH Figure 6.7b.

3. HH Exercise 6.3.

4. Show that the voltage at the positive input of the op-amp in the circuit in HH Figure 6.24 is

$$V_{\text{out}} = \frac{R_2}{R_1}\frac{kT}{q}\ln\left(\frac{R_2 I_{S2}}{R_3 I_{S1}}\right) + V_{BE3}$$

   and explain how this demonstrates that the circuit can be made to have zero temperature coefficient. Begin by assuming zero base currents and a constant current through $Q_1$, and realize that $Q_1$ and $Q_2$ form a current mirror. The constant base current is supplied by the op-amp positive feedback.