Instructions, notes, and hints:

Provide the details of all solutions, including important intermediate steps. You will not receive credit if you do not show your work.

Some problems might be solvable (or must be solved) using good engineering approximations or assumptions. In those cases, your answer might differ from the posted answer by a fairly large margin. Given typical device variations and component tolerances, that amount of discrepancy is often reasonable. If you justify any approximations you make, you will be given full credit for such answers.

Prob. 7.34: Your answers to parts a and c should be symbolic in terms of $g_m$ and $r_o$.

Prob. 7.36: $A_o = g_m r_o$.

Prob. 8.37: This is a very simple problem if you think about it first. Assume that both collector resistors and both transistors are perfectly matched.

Prob. 8.50: The 2-mW power dissipation limit applies to the whole amplifier circuit. That is, it includes the two resistors, the two amplifying transistors, and the ideal current source $I$. You could total the power dissipations of all five devices, but there is an easier way to determine what the power limit constraint implies.

Prob. 8.56: You may assume that $I_E \approx I_C$; that is, $\alpha \approx 1$.

Assignment:

Problems 7.34ac, 7.36, 8.36, 8.37, 8.50, and 8.56 in the textbook, plus the following additional problems:

1. Following the derivation given in Subsection 8.3.3 in Sedra & Smith, find an expression for the relationship between the total collector current $i_{C1}$ and the input voltage $v_{id}$ for the diff amp circuit shown in Figure 8.18a of the book. Note that this circuit has addition resistors $R_e$ inserted in series with the emitters of the two BJTs. Using Matlab to plot $i_{C1}/I$ (the collector current of $Q_1$, normalized by the mirror current $I$) vs. $v_{id}/V_T$ for $IR_e = 0$, $10V_T$, and $20V_T$, where $IR_e$ is the mirror current times the emitter resistor (it is also twice the quiescent voltage across $R_e$). That is, reproduce Figure 8.18b in the book. You may make all of the usual engineering approximations as necessary, including neglecting the Early effect.
