1. The open-loop gain curve for an LF157/357 op-amp is shown at the right. This is a detailed view of the high frequency end of the curve, and explicitly shows the phase as well as the magnitude of the gain. The reference for the phase at low frequencies for this plot is $+180^\circ$ instead of the usual $0^\circ$, so you’ll need to subtract $180^\circ$ from the values given here.

a) What is the gain-bandwidth product for this op-amp?

b) If you use it as a unity-gain buffer ($\beta = -1$), what is the phase margin? Is this a useable amplifier circuit?

c) What is the minimum closed-loop gain ($-\beta^{-1}$) that will provide a reasonably safe $45^\circ$ phase margin?

d) What is the 3 dB bandwidth of the amplifier at this gain? The gain-bandwidth product?

e) Suppose your circuit in part c) is a conventional non-inverting amplifier with a voltage divider on the output connecting a fraction $\beta$ of the output back to the negative input. We usually assume this $\beta$ is entirely real, but suppose there is a significant stray capacitance between the wiring to the negative input and ground. Explain the qualitative effect on your phase margin. If the bottom resistor in the divider is 10 K ohms (the gain then determines the top one) and the stray capacitance is 5 pF, at what frequency do you get an additional $45^\circ$ phase shift?

2. Do "Additional Exercise" 1 on p 107 in H&H. (See p 63 on power switching with a transistor for ideas on this.)

3. Examine the "Bad Circuits" on p 108 in H&H. Give a one-sentence reason why each of them won’t work, or otherwise is a bad idea. (Hint: watch for wrong polarity on NPN/PNP transistors.) Remember how zener diodes are normally used: see pp 13 - 14.