2.98 A particular inverting amplifier with nominal gain of −100 V/V uses an imperfect op amp in conjunction with 100-kΩ and 10-MΩ resistors. The output voltage is found to be +5.3 V when measured with the input open and +5 V with the input grounded.

(a) What is the bias current of this amplifier? In what direction does it flow?

(b) Estimate the value of the input offset voltage.

(c) A 10-MΩ resistor is connected between the positive-input terminal and ground. With the input left floating (disconnected), the output dc voltage is measured to be −0.6 V. Estimate the input offset current.

2.119 Consider the use of an op amp with a unity-gain frequency f_t in the realization of:

(a) An inverting amplifier with dc gain of magnitude K.
(b) A noninverting amplifier with a dc gain of K.

In each case find the 3-dB frequency and the gain–bandwidth product (GBP $\equiv$ |Gain| $\times f_{3\text{dB}}$). Comment on the results.

***2.120** Consider an inverting summer with two inputs V_1 and V_2 and with $V_o = -(V_1 + 3V_2)$. Find the 3-dB frequency of each of the gain functions V_o/V_1 and V_o/V_2 in terms of the op amp f_t. (*Hint:* In each case, the other input to the summer can be set to zero—an application of superposition.)

3.4 For a silicon crystal doped with phosphorus, what must N_D be if at $T = 300$ K the hole concentration drops below the intrinsic level by a factor of 10^8?