Probs 4076

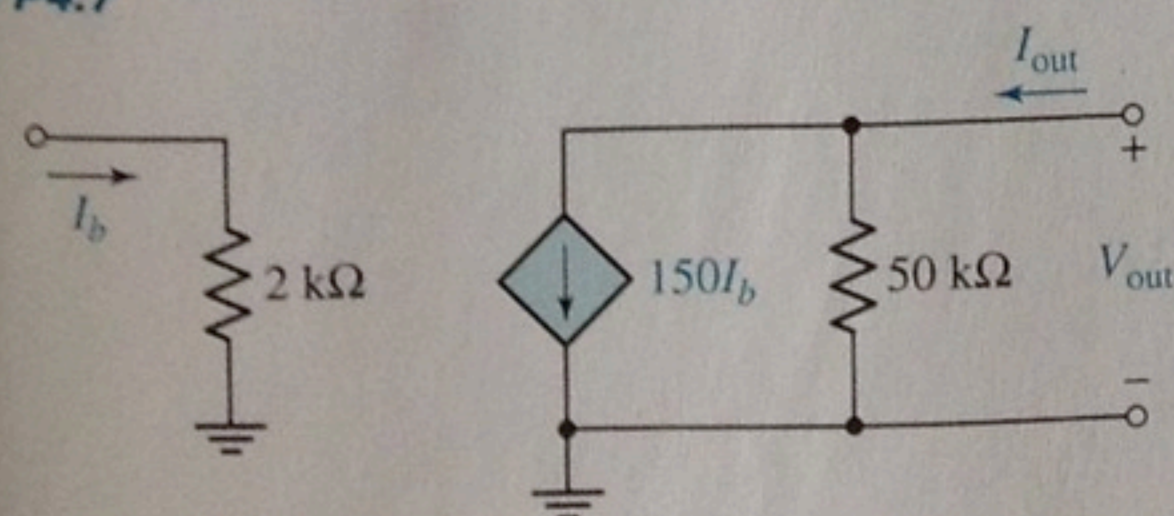
March 2013 - exam 2

Textbook sections

- 11-1,11-2,11-4
- 13-6 to 13-8 (sect. 13-1 to 13-5 for reference)
- 14-1 to 14-5

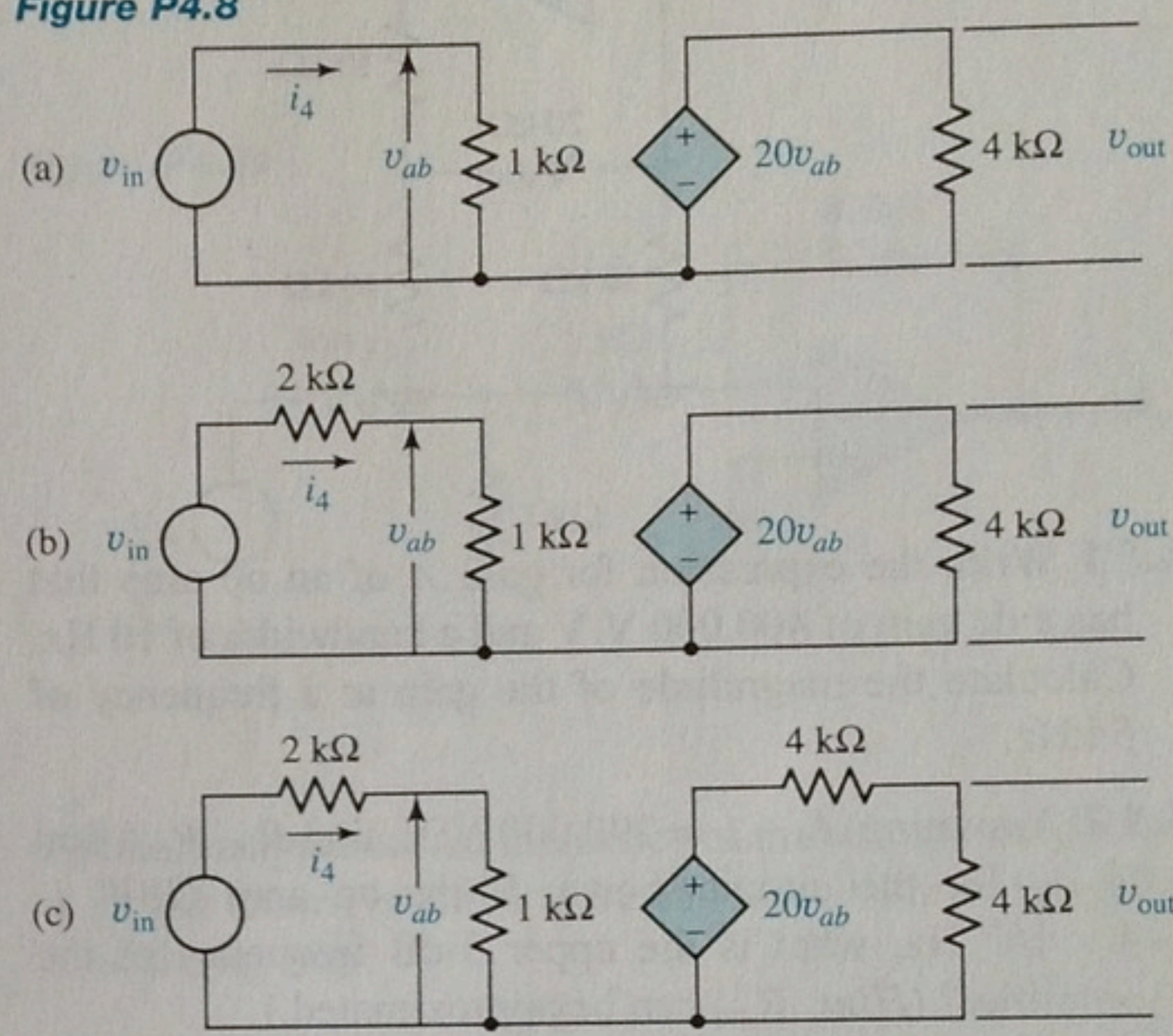
☆ **4.7** Plot I_{out} as a function of V_{out} for the circuit shown as V_{out} varies from 0 V to 10 V in 2-V increments. Plot this characteristic for $I_b = 10\ \mu A$, $20\ \mu A$, and $30\ \mu A$.

Figure P4.7



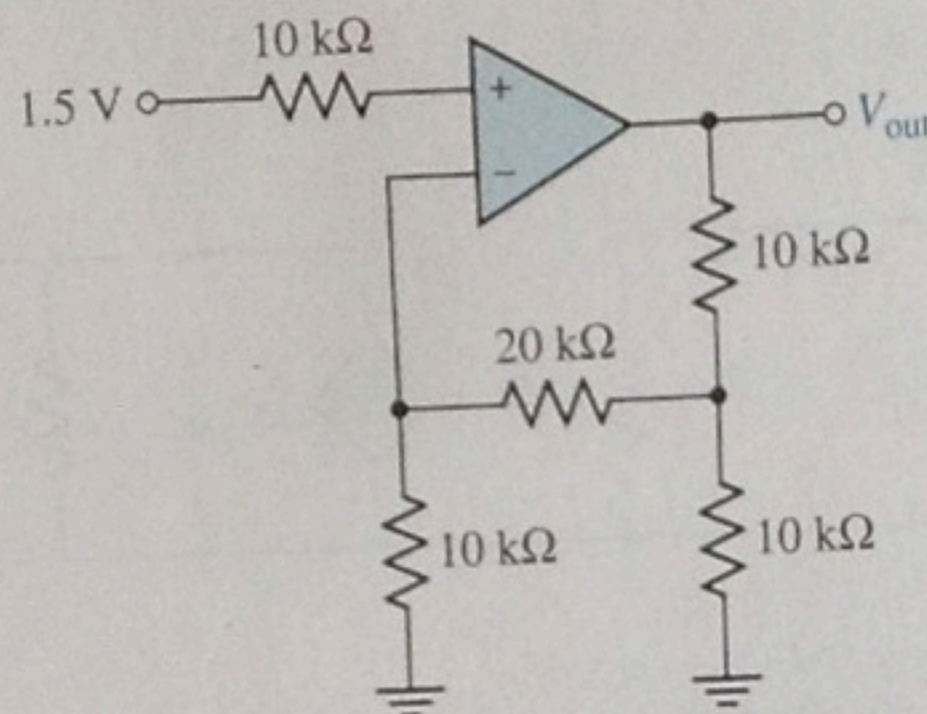
4.8 If $v_{in} = 0.5 \cos \omega t$, calculate v_{out} for each circuit in the figure.

Figure P4.8



.10 Calculate the output voltage for the circuit shown.

igure P4.10

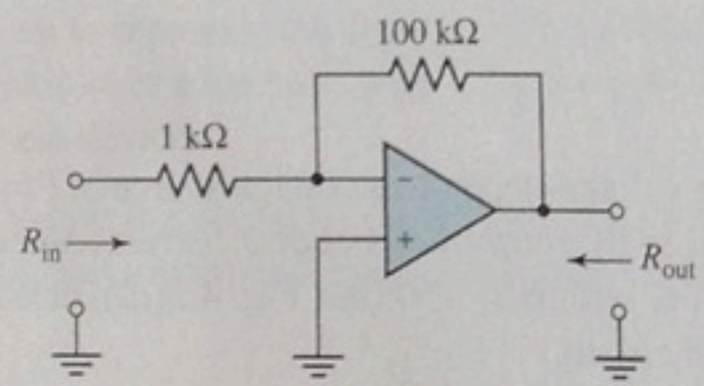


4.11 Write the expression for gain A of an op amp that has a dc gain of 400,000 V/V and a bandwidth of 10 Hz. Calculate the magnitude of the gain at a frequency of 5 kHz.

5 kHz.

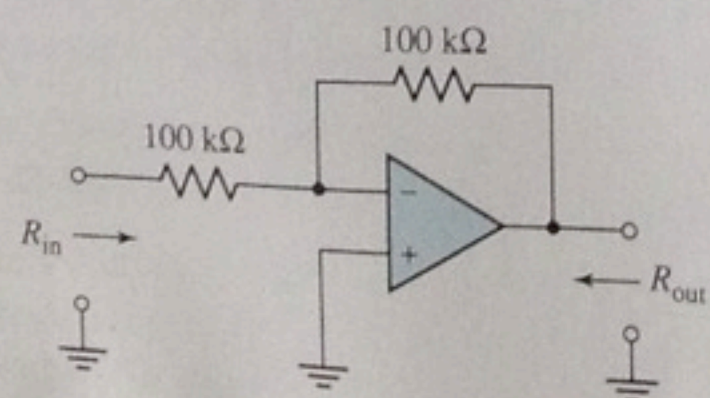
4.12 Assuming $A_{MBoa} = 200{,}000$ V/V, find R_{in}, R_{out}, and A_{MBi} for the circuit shown. If the op amp GBW is 4×10^6 Hz, what is the upper 3-dB frequency of the amplifier? (*Hint:* R_{out} can be approximated.)

Figure P4.12



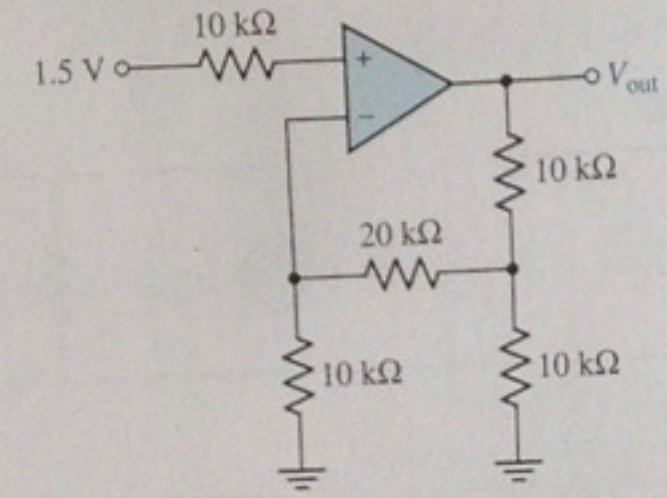
4.13 Assuming $A_{MBoa} = 200{,}000$ V/V, find R_{in}, R_{out}, and A_{MBi} for the circuit shown. If the op amp GBW is 4×10^6 Hz, what is the upper 3-dB frequency of the amplifier? (*Hint:* R_{out} can be approximated.)

Figure P4.13



4.10 Calculate the output voltage for the circuit shown.

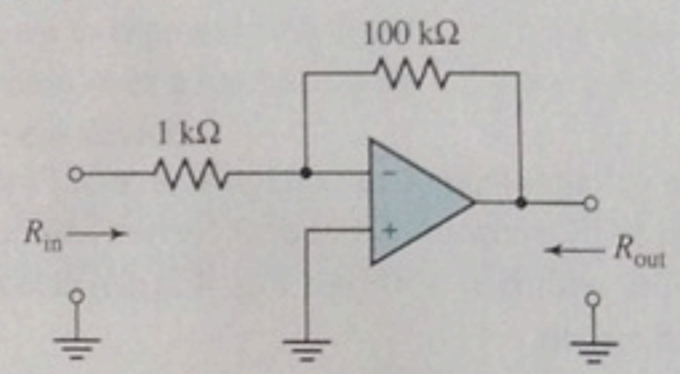
Figure P4.10



4.11 Write the expression for gain A of an op amp that has a dc gain of 400,000 V/V and a bandwidth of 10 Hz. Calculate the magnitude of the gain at a frequency of 5 kHz.

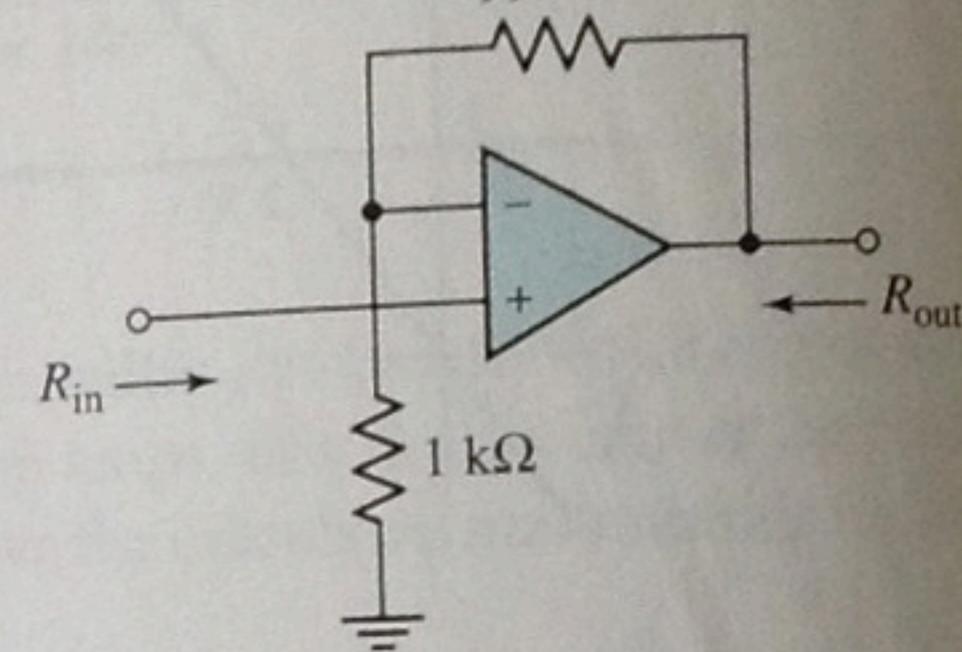
4.12 Assuming $A_{MBoa} = 200{,}000$ V/V, find R_{in}, R_{out}, and A_{MBi} for the circuit shown. If the op amp GBW is 4×10^6 Hz, what is the upper 3-dB frequency of the amplifier? (*Hint:* R_{out} can be approximated.)

Figure P4.12



4.14 Assuming $A_{MBoa} = 200{,}000$ V/V, find R_{in}, R_{out}, and A_{MBni} for the circuit shown. If the op amp *GBW* is 4×10^6 Hz, what is the upper 3-dB frequency of the amplifier? (*Hint:* R_{in} and R_{out} can be approximated.)

Figure P4.14



at
z.

4.15 Either of the unity-gain stages shown can be used to

d
is
le

D 4.16 Using an op amp with $GBW_{oa} = 4 \times 10^6$ Hz, design a noninverting amplifier with a midband voltage gain of 75 V/V. What is the bandwidth of the amplifier?

D 4.17 Using an op amp with $GBW_{oa} = 4 \times 10^6$ Hz, design an inverting amplifier with a midband voltage gain of −10 V/V. What is the bandwidth of the amplifier?

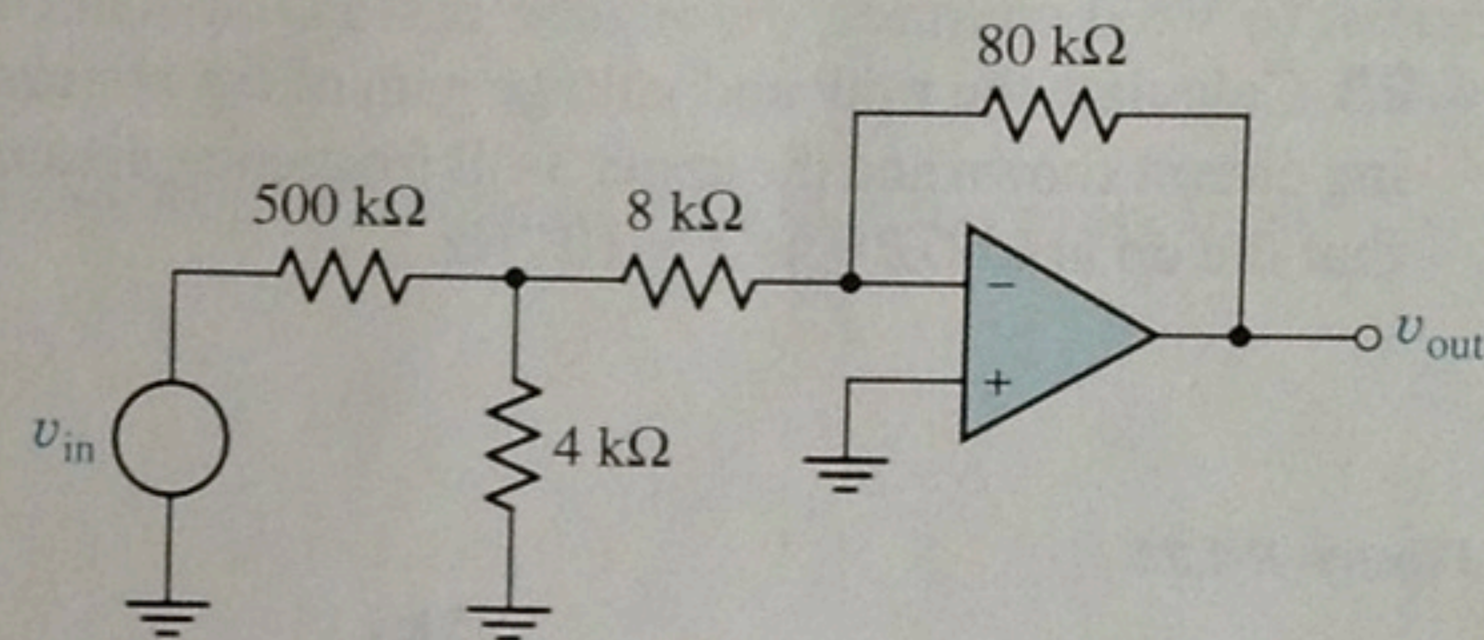
☆ **4.20** For the amplifier of the figure:

(a) Calculate $A_{MB} = v_{out}/v_{in}$.

(b) If the *GBW* of the op amp is 4 MHz, what is the upper corner frequency of the voltage gain?

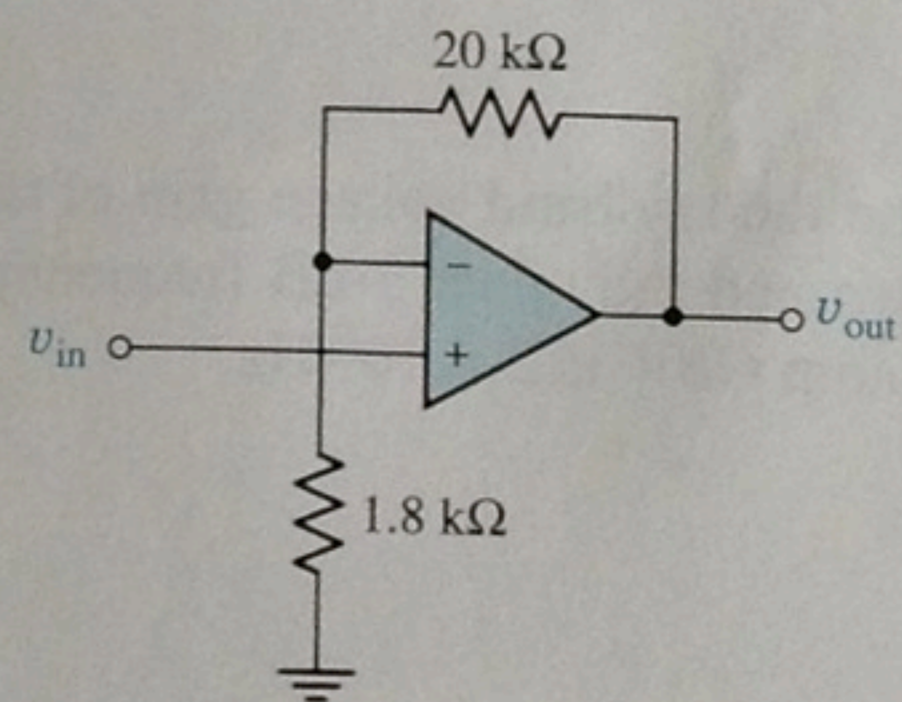
(c) Write an expression for the voltage gain as a function of frequency.

Figure P4.20



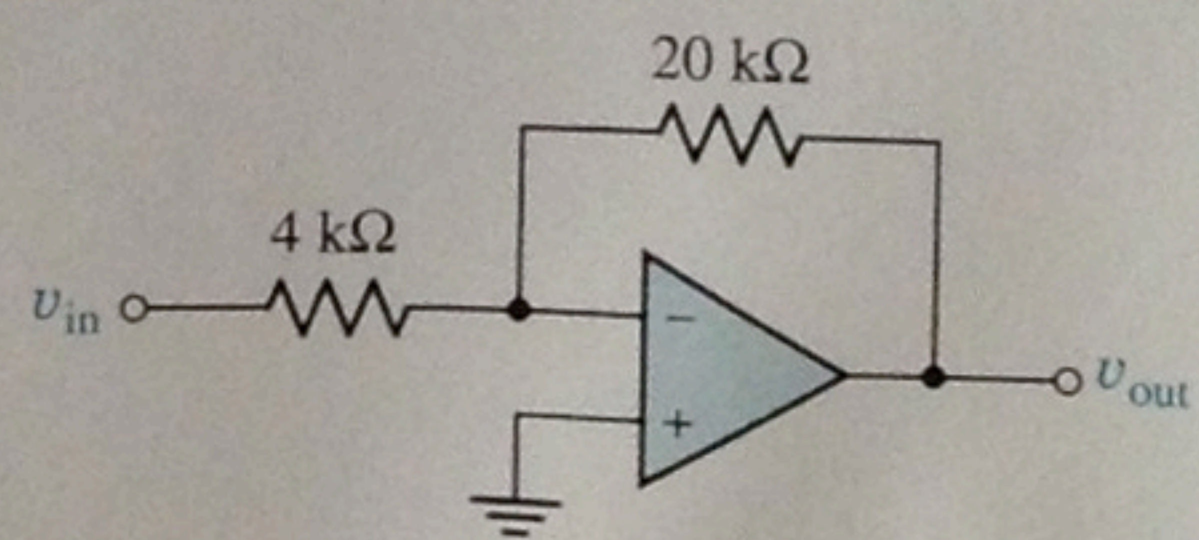
4.21 The upper corner frequency of the voltage gain for the circuit shown is found to be 150 kHz. What is the *GBW* of the op amp?

Figure P4.21



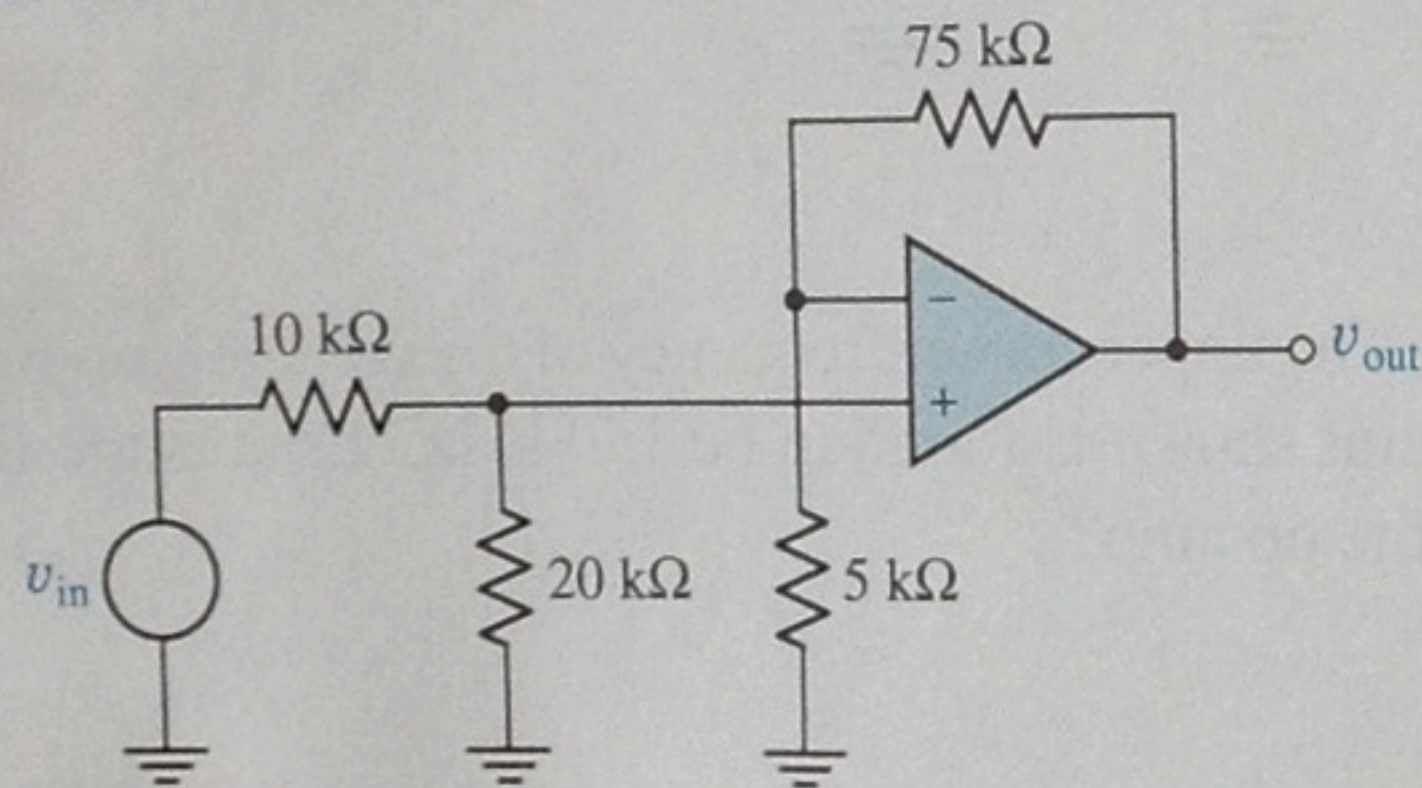
4.22 The upper corner frequency of the voltage gain for the circuit shown is found to be 150 kHz. What is the *GBW* of the op amp?

Figure P4.22



4.25 Calculate the midband voltage gain of the noninverting circuit shown and the upper 3-dB frequency, assuming that the op amp *GBW* is 2×10^6 Hz.

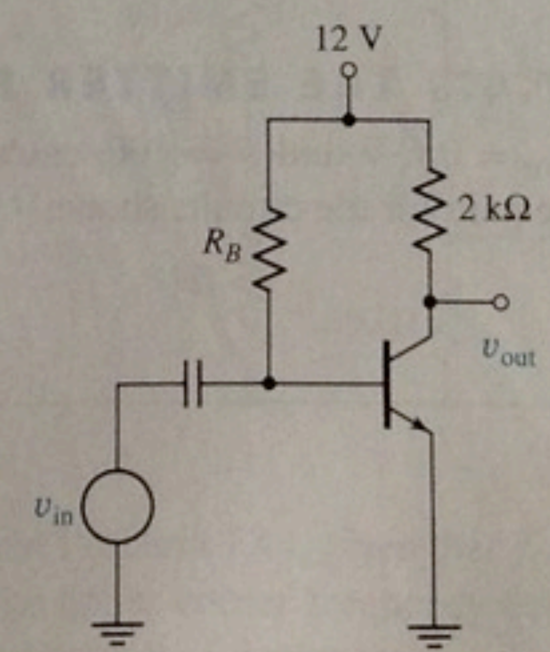
Figure P4.25



SECTION 7.4.2 AND 7.4.4 THE COMMON-EMITTER CONFIGURATION

7.26 Calculate the midband voltage gain of the circuit shown if $\alpha = 0.99$ and $I_E = 2$ mA. Calculate the input impedance of the stage. What will the maximum peak-to-peak output signal be when cutoff is reached?

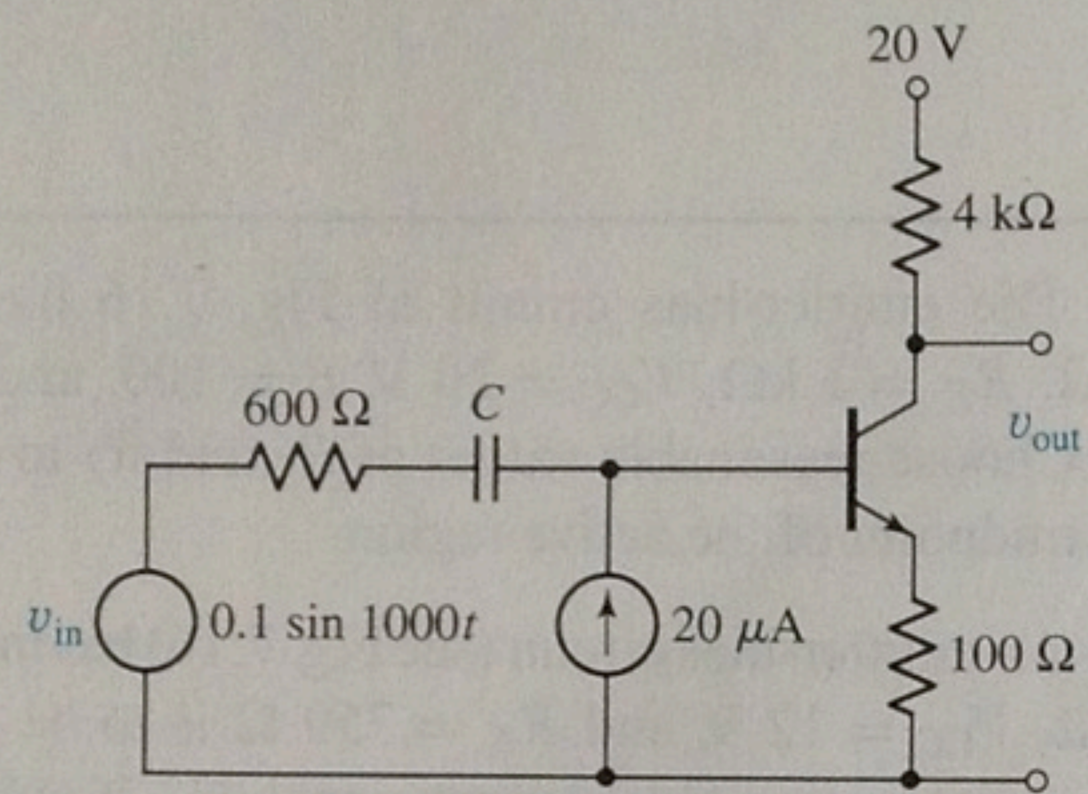
Figure P7.26



7.27 Repeat Problem 7.26 if I_E is changed to 1 mA.

7.28 If $\beta = 100$, calculate the midband voltage gain and sketch the output voltage including the dc component for the circuit shown.

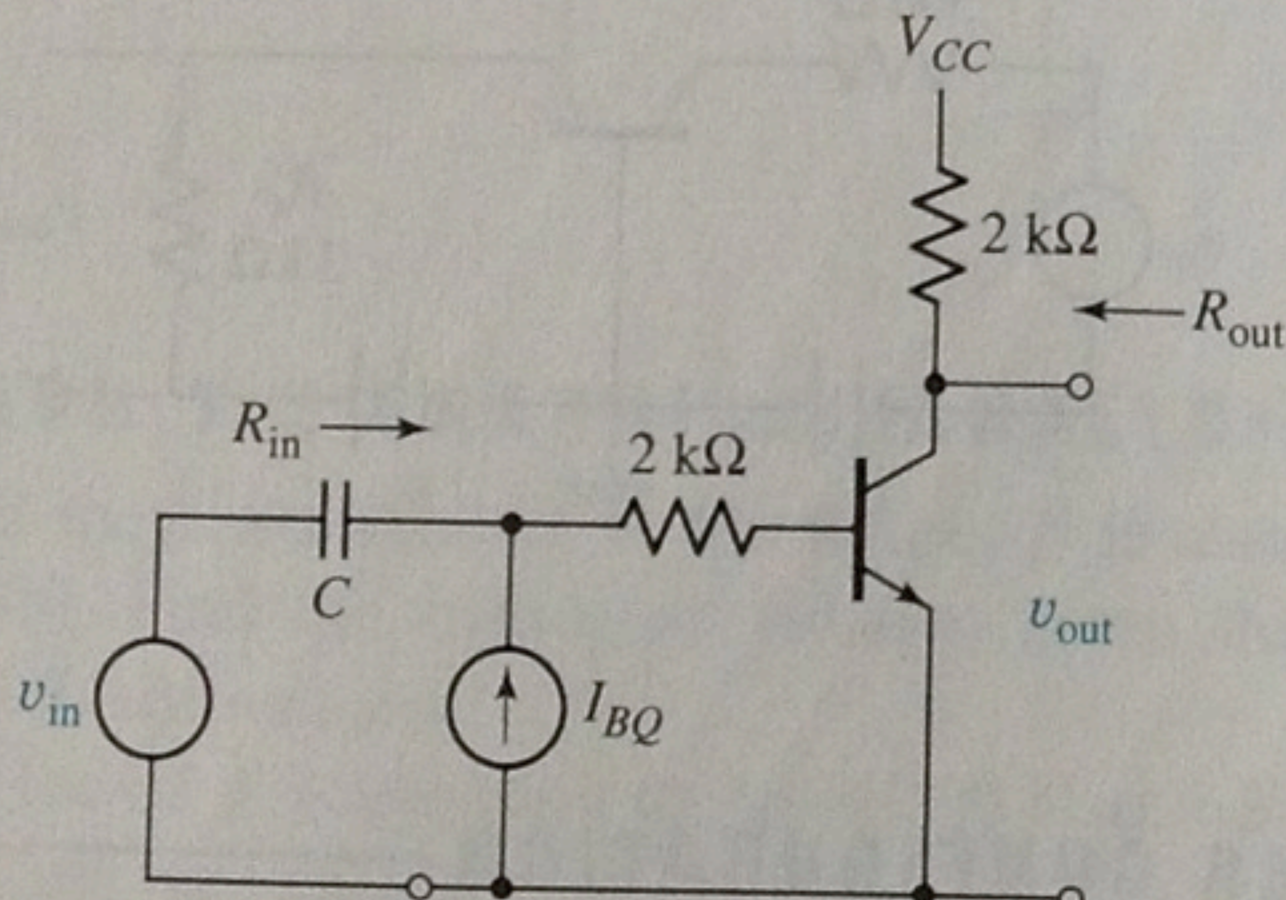
Figure P7.28



7.29 If I_{BQ} is reduced to 5 μA in Problem 7.28, calculate the midband voltage gain. Compare to the gain when $I_{BQ} = 30\ \mu$A.

7.30 Calculate the midband voltage gain of the circuit shown if $\beta = 100$ and $I_E = 2$ mA. Calculate the input and output impedances of the circuit.

Figure P7.30



7.31 Repeat Problem 7.30 if a 100-Ω resistance is inserted between emitter and ground.

7.32 If $V_{BE(on)} = 0.6$ V, calculate the midband voltage gain for the circuit shown.

Figure P7.32