

24. An ICVS amplifier is saturated. A possible trouble is
- No supply voltages
 - Open feedback resistor
 - No input voltage
 - Open load resistor

25. A VCVS amplifier has no output voltage. A possible trouble is
- Shorted load resistor
 - Open feedback resistor
 - Excessive input voltage
 - Open load resistor

26. An ICIS amplifier is saturated. A possible trouble is
- Shorted load resistor
 - R_2 is open
 - No input voltage
 - Open load resistor

27. An ICVS amplifier has no output voltage. A possible trouble is
- No positive supply voltage
 - Open feedback resistor
 - No feedback voltage
 - Shorted load resistor

28. The closed-loop input impedance in a VCVS amplifier is
- Usually larger than the open-loop input impedance
 - Equal to the open-loop input impedance
 - Sometimes less than the open-loop input impedance
 - Ideally zero

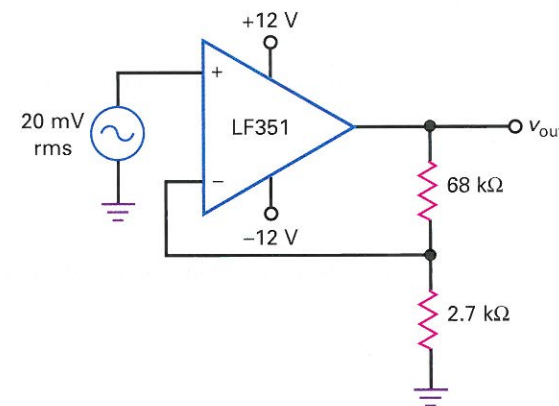
Problems

In the following problems, refer to Table 18-2 as needed for the parameters of the op amps

SEC. 19-2 VCVS VOLTAGE GAIN

- 19-1 In Fig. 19-15, calculate the feedback fraction, the ideal closed-loop voltage gain, the percent error, and the exact voltage gain.

Figure 19-15

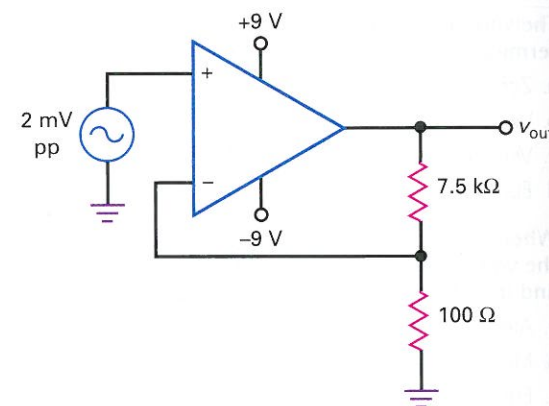


- 19-2 If the 68-k Ω resistor of Fig. 19-15 is changed to 39 k Ω , what is the feedback fraction? The closed-loop voltage gain.
- 19-3 In Fig. 19-15, the 2.7-k Ω resistor is changed to 4.7 k Ω . What is the feedback fraction? The closed-loop voltage gain?
- 19-4 If the LF351 of Fig. 19-15 is replaced by an LM308, what is the feedback fraction, the ideal closed-loop voltage gain, the percent error, and the exact voltage gain?

SEC. 19-3 OTHER VCVS EQUATIONS

- 19-5 In Fig. 19-16, the op amp has an R_{in} of 3 M Ω and an R_{CM} of 500 M Ω . What is the closed-loop input impedance? Use an A_{VOL} of 200,000 for the op amp.

Figure 19-16

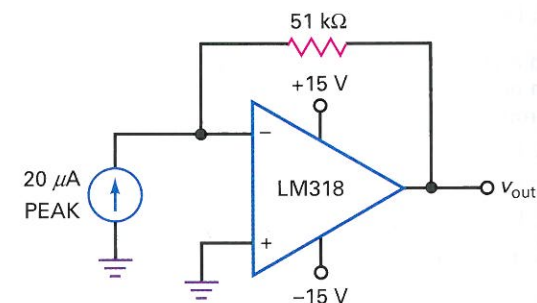


- 19-6 What is the closed-loop output impedance in Fig. 19-16? Use an A_{VOL} of 75,000 and an R_{out} of 50 Ω .
- 19-7 Suppose the amplifier of Fig. 19-16 has an open-loop total harmonic distortion of 10 percent. What is the closed-loop total harmonic distortion?

SEC. 19-4 THE ICVS AMPLIFIER

- 19-8 **MultiSim** In Fig. 19-17, the frequency is 1 kHz. What is the output voltage?

Figure 19-17



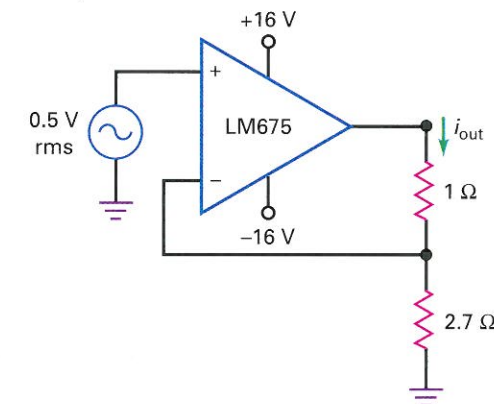
- 19-9 **MultiSim** What is the output voltage in Fig. 19-17 if the feedback resistor is changed from 51 to 33 k Ω ?

- 19-10 In Fig. 19-17, the input current is changed to 10.0 μ A rms. What is the peak-to-peak output voltage?

SEC. 19-5 THE VCIS AMPLIFIER

- 19-11 **MultiSim** What is the output current in Fig. 19-18? The load power?

Figure 19-18



- 19-12 If the load resistor is changed from 1 to 3 Ω in Fig. 19-18, what is the output current? The load power?
- 19-13 **MultiSim** If the 2.7- Ω resistor is changed to 4.7 Ω in Fig. 19-18, what are the output current and load power?

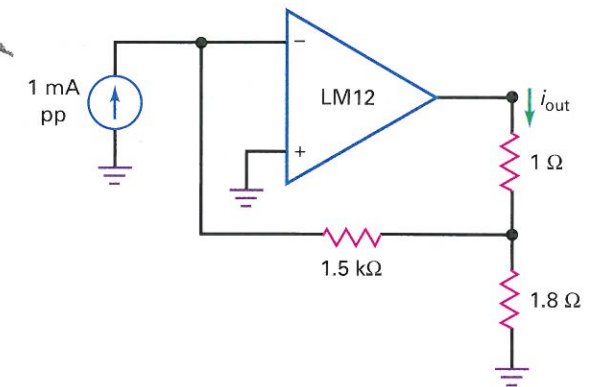
SEC. 19-6 THE ICIS AMPLIFIER

- 19-14 **MultiSim** What is the current gain in Fig. 19-19? The load power?
- 19-15 **MultiSim** If the load resistor is changed from 1 to 2 Ω in Fig. 19-19, what is the output current? The load power?

Critical Thinking

- 19-22 Figure 19-20 is a current-to-voltage converter that can be used to measure current. What does the voltmeter read when the input current is 4 μ A?
- 19-23 What is the output voltage in Fig. 19-21?
- 19-24 In Fig. 19-22, what is the voltage gain of the amplifier for each position of the switch?
- 19-25 In Fig. 19-22, what is the output voltage for each position of the switch if the input voltage is 10 mV?
- 19-26 A 741C with $A_{VOL} = 100,000$, $R_{in} = 2$ M Ω , and $R_{out} = 75 \Omega$ is used in Fig. 19-22. What are the closed-loop input and output impedances for each switch position?

Figure 19-19



- 19-16 If the 1.8- Ω resistor is changed to 7.5 Ω in Fig. 19-19, what are the current gain and load power?

SEC. 19-7 BANDWIDTH

- 19-17 A VCVS amplifier uses an LM324 with $(1 + A_{VOL}B) = 1000$ and $f_{2(OL)} = 2$ Hz. What is the closed-loop bandwidth?
- 19-18 If a VCVS amplifier uses an LM833 with $A_{VOL} = 316,000$ and $f_{2(OL)} = 4.5$ Hz, what is the closed-loop bandwidth for $A_{V(CL)} = 75$?
- 19-19 An ICVS amplifier uses an LM318 with $A_{VOL} = 20,000$ and $f_{2(OL)} = 750$ Hz. What is the closed-loop bandwidth?
- 19-20 An ICIS amplifier uses a TL072 with $f_{2(OL)} = 120$ Hz. If $(1 + A_{VOL}B) = 5000$, what is the closed-loop bandwidth?
- 19-21 A VCVS amplifier uses an LM741C with $f_{unity} = 1$ MHz and $S_R = 0.5$ V/ μ s. If $A_{V(CL)} = 10$, what is the closed-loop bandwidth? The largest undistorted peak output voltage at $f_{2(CL)}$?

Figure 19-20

