Assignment 2

9.1 Assume the op-amps in Figure P9.1 are ideal. Find the voltage gain $A_v = v_O/v_I$ and the input resistance R_i of each circuit.

9.2 Consider an ideal inverting op-amp with $R_2 = 100\,\text{k}\Omega$ and $R_1 = 10\,\text{k}\Omega$. (a) Determine the ideal voltage gain and input resistance R_i. (b) Repeat part (a) for a second $100\,\text{k}\Omega$ resistor connected in parallel with R_2. (c) Repeat part (a) for a second $10\,\text{k}\Omega$ resistance connected in series with R_1.

D9.3 Design an inverting op-amp circuit with a voltage gain of $A_v = v_O/v_I = -12$ and an input resistance of $R_i = 25\,\text{k}\Omega$.

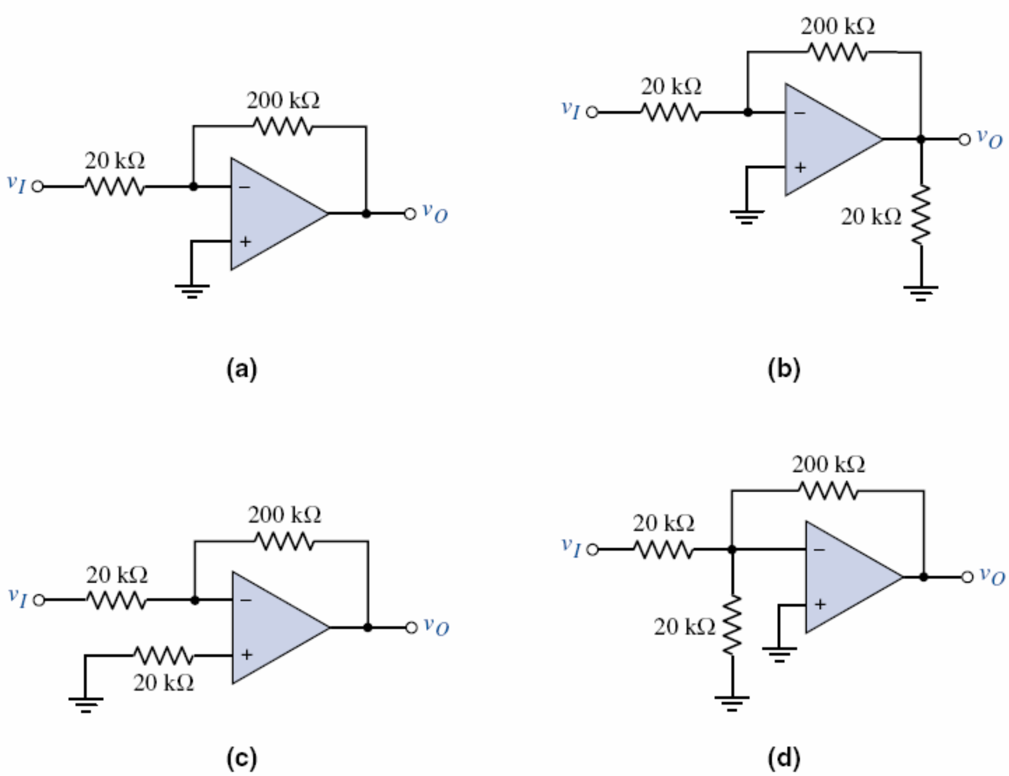


Figure P9.1

D9.4 Design an inverting op-amp circuit with a voltage gain of $A_v = v_O/v_I = -8$. When the input voltage is $v_I = -1\,\text{V}$, the maximum current in R_1 and R_2 must be no larger than $15\,\mu\text{A}$. Determine the minimum values of R_1 and R_2.

9.29 Determine v_O as a function of v_{I1} and v_{I2} for the ideal noninverting op-amp circuit in Figure P9.29.

9.30 Consider the ideal noninverting op-amp in Figure P9.30. Determine v_O as a function of v_{I1} and v_{I2}.

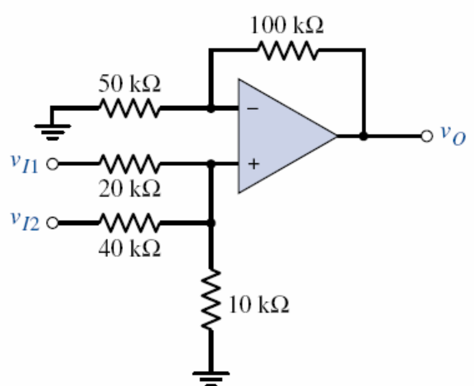


Figure P9.30

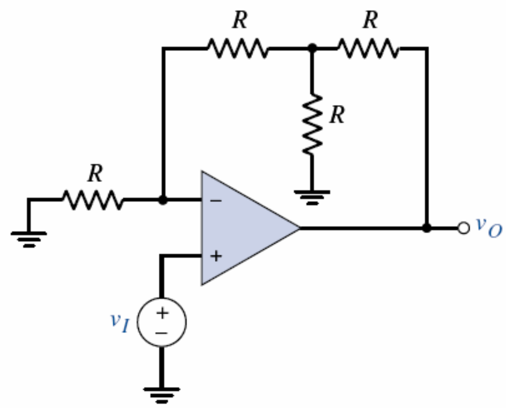


Figure P9.31

9.31 Determine the gain $A_v = v_O/v_I$ for the ideal op-amp circuit in Figure P9.31.

9.34 Consider the ideal op-amp circuit shown in Figure P9.34. Determine the voltage gains $A_{v1} = v_{O1}/v_I$ and $A_{v2} = v_{O2}/v_I$. What is the relationship between v_{O1} and v_{O2}?

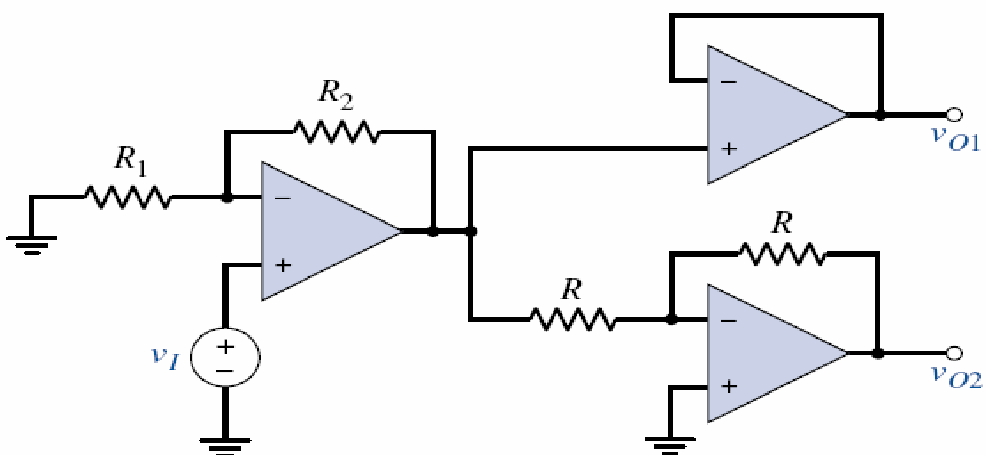
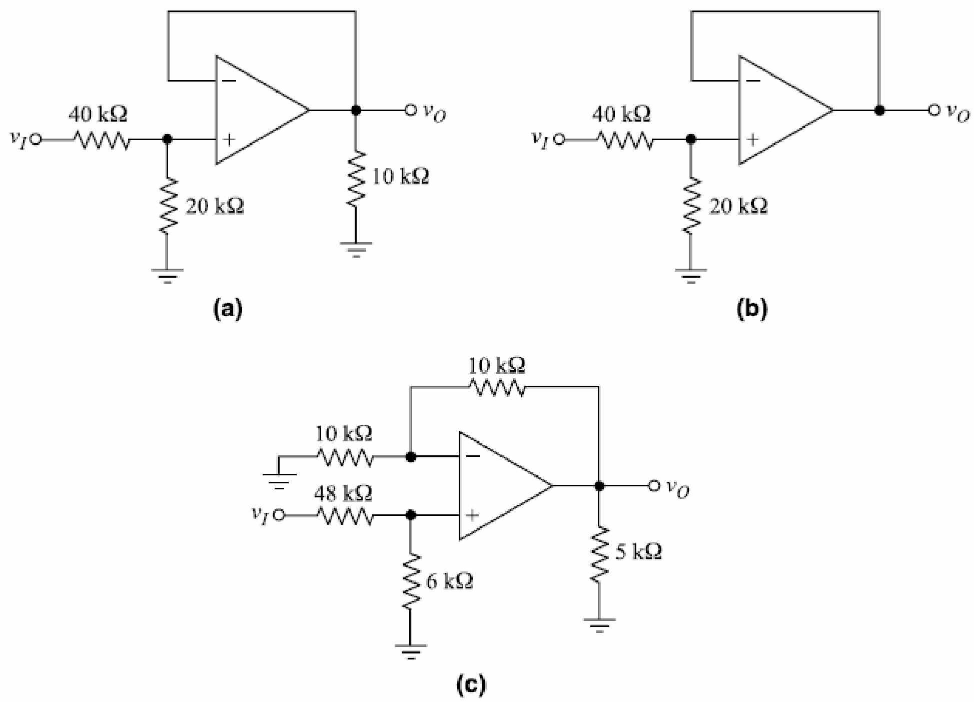


Figure P9.34

9.36 The input voltage is $v_I = 6$ V for each ideal op-amp circuit shown in Figure P9.36. Determine each output voltage.


40 kΩ
v_I
v_O
20 kΩ
10 kΩ
(a)
40 kΩ
v_I
v_O
20 kΩ
(b)
10 kΩ
10 kΩ
48 kΩ
v_I
v_O
6 kΩ
5 kΩ
(c)
Figure P9.36