

14.50 Find the transfer function for the network in Fig. P14.50.

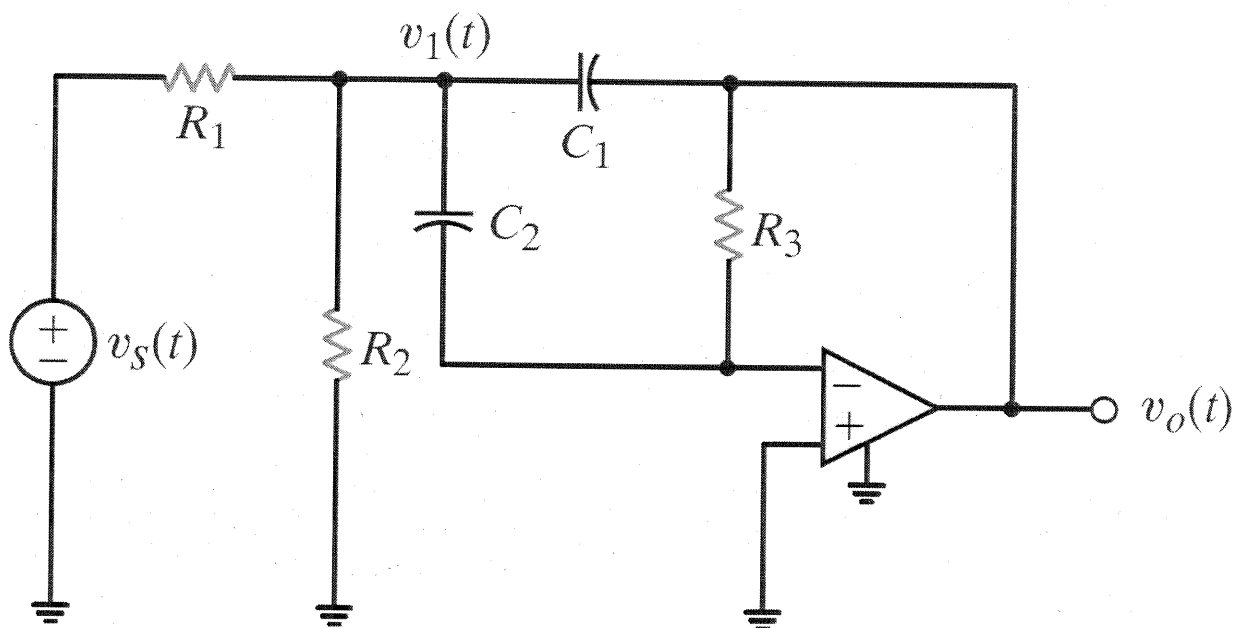
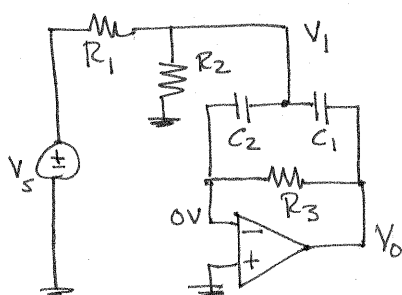


Figure P14.50

SOLUTION: Redrawn



Nodal analysis

$$V_1 sC_2 + V_o/R_3 = 0 \Rightarrow V_1 = -V_o / sC_2 R_3$$

$$\frac{V_s - V_1}{R_1} = \frac{V_1}{R_2} + V_1 sC_2 + (V_1 - V_o) sC_1$$

$$\frac{V_s}{R_1} = -V_o \left[sC_1 + \frac{1}{sC_2 R_3} \left(\frac{1}{R_1} + \frac{1}{R_2} + s(C_2 + C_1) \right) \right]$$

$$\frac{V_o}{V_s} = \frac{-1/R_1}{sC_1 + \frac{C_1 + C_2}{C_2 R_3} + \frac{R_1 + R_2}{sR_1 R_2 R_3 C_2}}$$

$$\boxed{\frac{V_o}{V_s} = \frac{-(1/C_1 R_1) s}{s^2 + s \left(\frac{C_1 + C_2}{C_1 C_2 R_3} \right) + \frac{R_1 + R_2}{C_1 C_2 R_1 R_2 R_3}}}$$