

Chapter 5, Solution 63.

The two op amps are summers. Let v_1 be the output of the first op amp. For the first stage,

$$v_1 = -\frac{R_2}{R_1}v_i - \frac{R_2}{R_3}v_o \quad (1)$$

For the second stage,

$$v_o = -\frac{R_4}{R_5}v_1 - \frac{R_4}{R_6}v_i \quad (2)$$

Combining (1) and (2),

$$\begin{aligned} v_o &= \frac{R_4}{R_5} \left(\frac{R_2}{R_1} \right) v_i + \frac{R_4}{R_5} \left(\frac{R_2}{R_3} \right) v_o - \frac{R_4}{R_6} v_i \\ v_o \left(1 - \frac{R_2 R_4}{R_3 R_5} \right) &= \left(\frac{R_2 R_4}{R_1 R_5} - \frac{R_4}{R_6} \right) v_i \\ \frac{v_o}{v_i} &= \frac{\frac{R_2 R_4}{R_1 R_5} - \frac{R_4}{R_6}}{1 - \frac{R_2 R_4}{R_3 R_5}} \end{aligned}$$