2.49

$$v_+ = v_I \frac{R_4}{R_3 + R_4} = v$$

$$\frac{v}{R_1} = \frac{v_o - v_-}{R_2} \Rightarrow v_o = v_-\left(1 + \frac{R_2}{R_1}\right)$$

From the two above equations:

$$\frac{v_o}{v_I} = \left(1 + \frac{R_2}{R_1}\right)\left(\frac{R_4}{R_3 + R_4}\right) = \frac{1 + R_2 / R_1}{1 + R_3 / R_4}$$

2.50

Refer to Fig. 2.50. Setting $v_2 = o$, we obtain the output component due to v_1 as:

$v_{o1} = -20\ v$

Setting $v_1 = o$, we obtain the output component due to v_2 as:

$$v_{O2} = v_2\left(1 + \frac{20R}{R}\right)\left(\frac{20R}{20R + R}\right) = 20\ v_2$$

The total output voltage is:

$v_o = v_{o1} + v_{o2} = 20\,(v_2 - v_1)$

For $v_1 = 10\text{Sin}\ 2\pi \times 60\text{t} - 0.1\ \text{Sin}\ (2\pi \times 1000\ t)$

$v_2 = 10\text{Sin}\ 2\pi \times 60\text{t} + 0.1\ \text{Sin}\ (2\pi \times 1000\ t)$

$v_o = 4\text{Sin}\ (2\pi \times 1000\ t)$

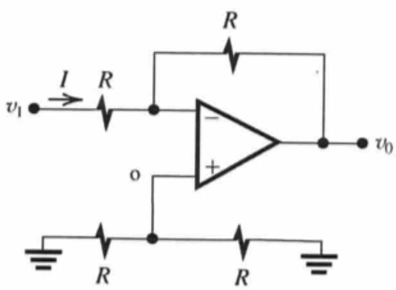
2.62

Refer to fig P2.62:

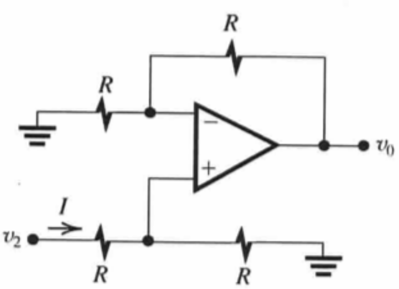
Considering that $v_- = v_+$:

$$v_1 + \frac{v_O - v_1}{2} = \frac{v_2}{2} \Rightarrow v_O = v_2 - v_1$$

v_1 only: $R_I = \frac{v_1}{I} = R$



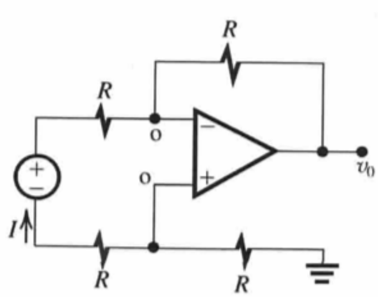
v_2 only: $R_I = \frac{v_2}{I} = 2R$



v_S between 2 terminals:

$R_I = \frac{v}{I} = 2R$

$v_+ = v_- = 0$



v_3 connected to both v_1 & v_2:

$R_I = \frac{v}{I} = R$

$v_+ = v_- = \frac{v_i}{2}$