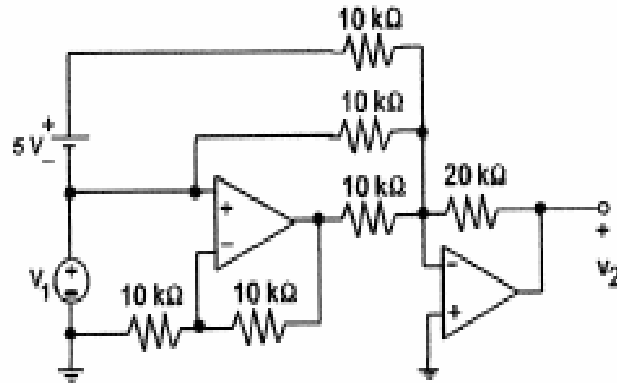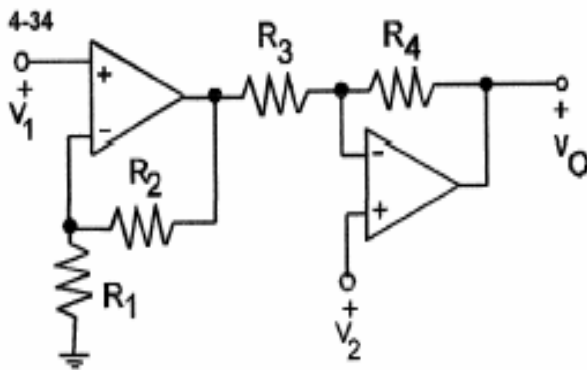# Homework Solutions 8

4-32

$$v_2 = \left(\frac{-20}{10}\right)\cdot(v_1 + 5) + \left(\frac{-20}{10}\right)\cdot v_1 + \left(\frac{-20}{10}\right)\cdot\left(\frac{10+10}{10}\cdot v_1\right) = -8\cdot v_1 - 10$$
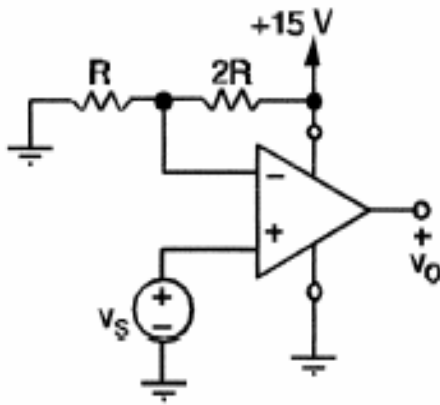
4-34

v_2 off

$$v_{O1} = \left(\frac{R_2 + R_1}{R_1}\right)\cdot\left(\frac{-R_4}{R_3}\right)\cdot v_1$$

v_1 off

$$v_{O2} = \left(\frac{R_4 + R_3}{R_3}\right)\cdot v_2$$

Using superposition

$$v_O = \left(\frac{R_4 + R_3}{R_3}\right)\cdot v_2 - \left(\frac{R_2 + R_1}{R_1}\right)\cdot\left(\frac{R_4}{R_3}\right)\cdot v_1$$
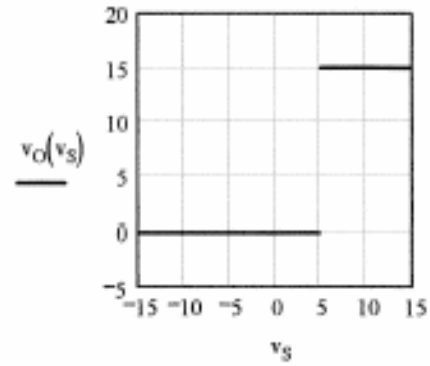
4-46 $v_S := -15, -14.9 .. 15$

(a) $v_P = v_S$ $v_n := 5$ $V_{OH} := 15$ $V_{OL} := 0$

$$v_O(v_S) := \begin{vmatrix} V_{OH} & \text{if } v_S > v_n \\ V_{OL} & \text{if } v_S < v_n \end{vmatrix}$$
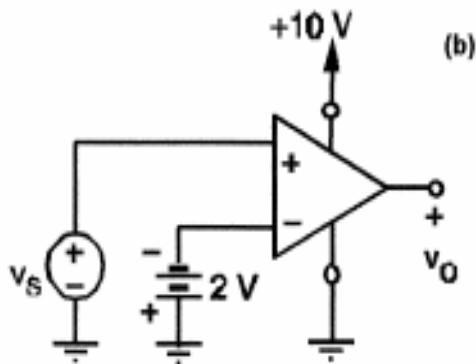
(b)

+15 V

R   2R

v_S

v_O

4-47 $V_{OH} := 10$ $V_{OL} := 0$

(a) $v_P = v_S$ $v_n := -2$ $v_O(v_S) := \begin{vmatrix} V_{OH} & \text{if } v_S > v_n \\ V_{OL} & \text{if } v_S < v_n \end{vmatrix}$

+10 V

(b)

v_S 2 V

v_O