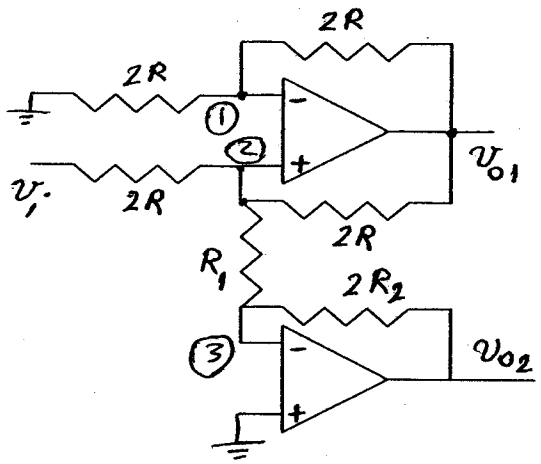
(ECE3455,Q3, Sum03) In the circuit shown,

a) Find the gain Vo1/Vi as a function of resistors.
b) Find the gain Vo2/Vi as a function of resistors.

(A)



solution:

(a) The voltage of node (1) is half of the V_{o1} or $V_{o1}/2$

so the voltage of node (2) is also $V_{o1}/2$, the voltage of node (3) is zero (0),

if we write a KCL at node (2) we'll have

$$\frac{V_i - V_{o1}/2}{2R} = \frac{V_{o1}/2 - V_{o1}}{2R} + \frac{V_{o1}/2}{R_1}$$

$$\frac{V_i}{2R} - \frac{V_{o1}}{4R} = -\frac{V_{o1}}{4R} + \frac{V_{o1}}{2R_1}$$

(1) $\boxed{\frac{V_{o1}}{V_i} = \frac{R_1}{R}}$ So it is a non-inverty amp. with a gain similar to inverting form

(b) writing a node voltage eq. at node (3)

$$\frac{V_{o1}/2}{R_1} = \frac{0 - V_{o2}}{2R_2} \quad \text{or} \quad V_{o2} = -\frac{R_2}{R_1} V_{o1}$$

Using eq (1) $V_{o2} = -\frac{R_2}{R_1} \times \frac{R_1}{R} V_i = -\frac{R_2}{R} V_i$

$$\boxed{V_o/V_i = -\frac{R_2}{R}}$$