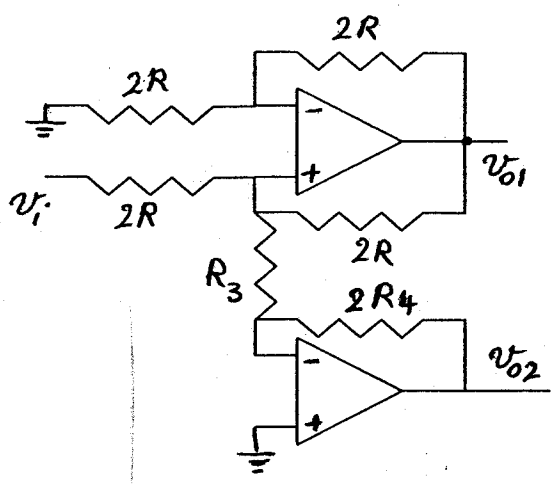
(ECE3455,Q3, Sum03) In the circuit shown,

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

(B)



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

$$\frac{v_i - v_{o1}/2}{2R} = \frac{v_{o1}/2 - v_{o1}}{2R} + \frac{v_{o1}/2}{R_3}$$

$$\frac{v_i}{2R} - \frac{v_{o1}}{4R} = -\frac{v_{o1}}{4R} + \frac{v_{o1}}{2R_3}$$

(1) $\boxed{\frac{v_{o1}}{v_i} = \frac{R_3}{R}}$ So it is a non-inverty amp. with a gain similar to inverting form

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

$$\frac{v_{o1}/2}{R_3} = \frac{0 - v_{o2}}{2R_4} \quad \text{or} \quad v_{o2} = -\frac{R_4}{R_3} v_{o1}$$

Using eq(1) $v_{o2} = -\frac{R_4}{R_3} \times \frac{R_3}{R} v_i = -\frac{R_4}{R} v_i$

$$\boxed{v_o/v_i = -\frac{R_4}{R}}$$