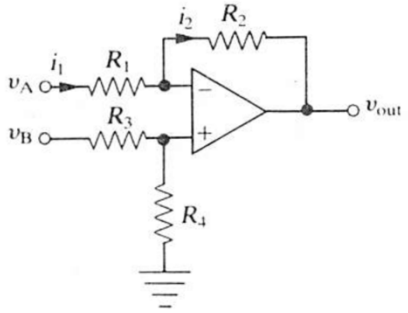
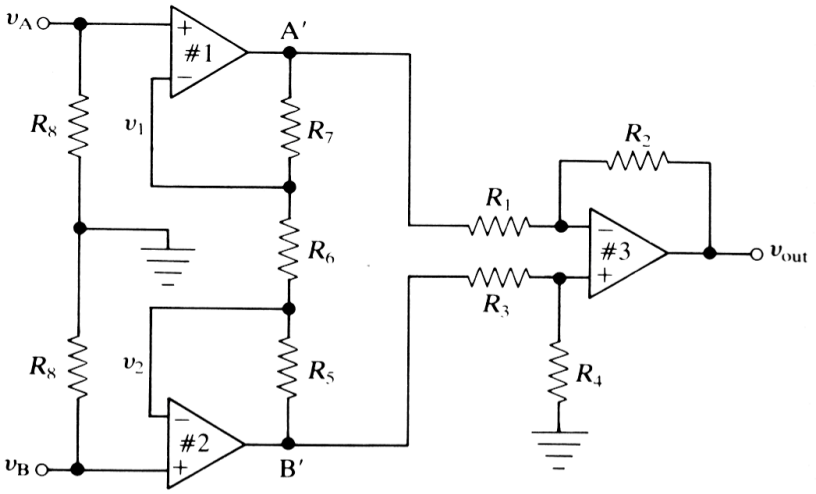
Phys2610 (2019) Assignment 5
Due 2 April 2019

1. Find a general expression for the output of the following circuit, and show that it reduces to $v_{out} = \frac{R_2}{R_1}(v_B - v_A)$ when $\frac{R_1}{R_2} = \frac{R_3}{R_4}$.

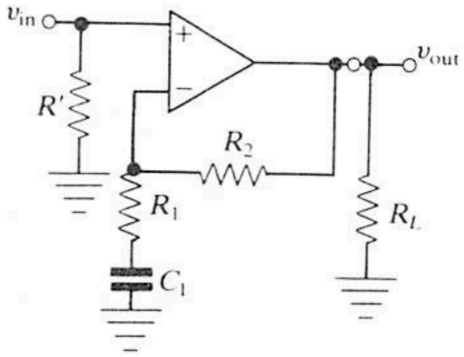


2. Show that the gain for the following circuit, with $R_5 = R_7 = R$, and $\frac{R_1}{R_2} = \frac{R_3}{R_4}$ is given by

$$a = \frac{v_{out}}{v_A - v_B} = -\frac{R_2}{R_1}\left(1 + \frac{2R}{R_6}\right)$$



3. Find an expression for the complex gain of the following circuit, when $\omega = \omega_1 = 1/(R_1 C_1)$.



4. Design a summing amplifier to sum from inputs v_A, v_B, v_C, v_D and to produce an output of $v_{out} = v_A + 2v_B + 4v_C + 8v_D$.

5. Design an op amp differentiator with an output given by $v_{out} = -(10^{-6}\text{s})\frac{d}{dt}v_{in}$. If an input step function rises from 0 to 1 V in 2 μs and then is constant at 1V, sketch the output.

6. Design an ideal diode op amp circuit to produce a negative half-waveform from a sinusoidal input.