Microelectronic Circuits I (Quiz 1)

1. (50%) The circuit shown blow utilizes an ideal op amp.
   (a) Find I_1, I_2, I_3, and V_x.
   (b) If V_O is not to be lower than -13V, find the maximum allowed value for R_L.
   (c) If R_L is varied in the range 100Ω to $1K\Omega$, what is the corresponding change in I_L and in V_O?
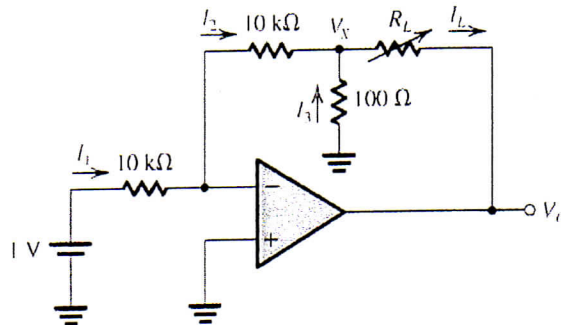
2. (50%) The circuit shown below is intended to supply a voltage to floating loads (those for which both terminals are ungrounded) while making greatest possible use of the available power supply.
   (a) Assuming ideal op amps, sketch the voltage waveforms at nodes B and C for a 1-V peak-to-peak sine eave applied at A, Also sketch v_O.
   (b) What is the voltage gain v_O/v_I?
   (c) Assuming that the op amps operate from ±15-V power supplies and that their output saturates at ±14V, what is the largest sine-wave output that can be accommodated? Specify both its peak-to-peak and rms values.