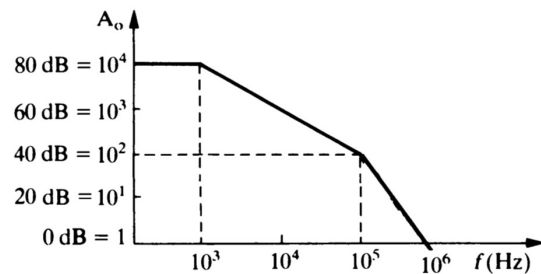
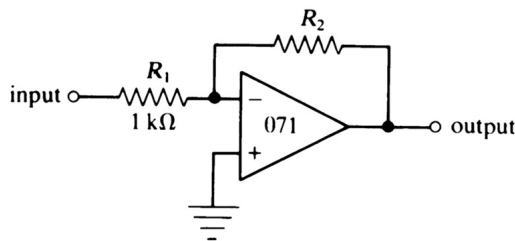


Physics 4700 HOMEWORK VI
Due November 22

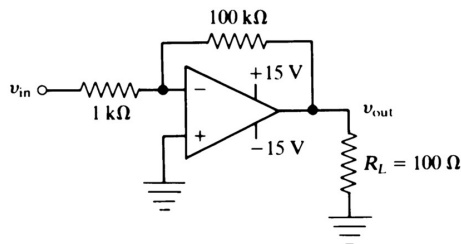
Note: Determine the gain roll-off vs. frequency for both parts a and b and compare it to the open loop gain roll-off vs. frequency for the op amp.

1. The open loop gain versus frequency for an uncompensated op amp is shown below. Would the inverting amplifier be stable for
 - a. $R_2 = 10 \text{ k}\Omega$?
 - b. $R_2 = 100 \text{ k}\Omega$?



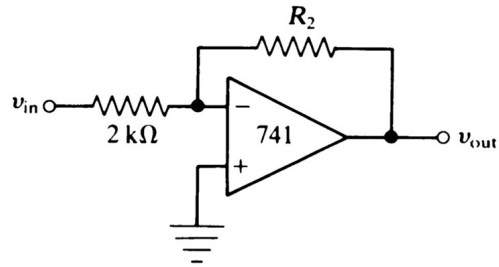
Note: The $\pm 15 \text{ V}$ power supplies for the op amp limit the output amplitude.

2. Although the output resistance of most op amps is extremely low when negative feedback is used, a typical inexpensive op amp can supply only a maximum current of approximately 25 mA. Calculate the maximum amplitude of a sinusoidal input (at low frequencies $\sim 1 \text{ kHz}$) that will produce an undistorted output across $R_L = 100 \Omega$. Repeat for $R_L = 1 \text{ k}\Omega$.



3. Design a summing amplifier circuit to sum from inputs v_A , v_B , v_C , v_D and to produce an output of $v_o = v_A + 2v_B + 4v_C + 8v_D$.
4. Design a voltage-to-current converter to convert a 1 mV input voltage to a 1 mA current through a 1 kΩ load resistor.
5. Design an op-amp differentiator whose output is,

$$v_{out} = -(10^{-6}) \frac{dV_{in}}{dt}$$
6. For a 741 op-amp with a slew rate of $0.5 \text{ V}/\mu\text{s}$, for $R_2 = 20 \text{ k}\Omega$, what is the maximum frequency of a sinusoidal input to avoid slew rate distortion in the output? The input peak-to-peak amplitude is 10 mV. Repeat for $R_2 = 200 \text{ k}\Omega$.



Note: For part c, you cannot just lower the power supply input to the op amp

7. The comparator is bipolar.
 - a. Sketch the output waveform if $V_{bb} = +5$ V.
 - b. Repeat for $V_{bb} = -5$ V
 - c. How would you change the circuit to produce output voltages of +5 V and -0.6 V?

