UNIVERSITY OF CALIFORNIA AT BERKELEY
College of Engineering
Dept. of Electrical Engineering and Computer Sciences

EECS 40 **Fall 2003**

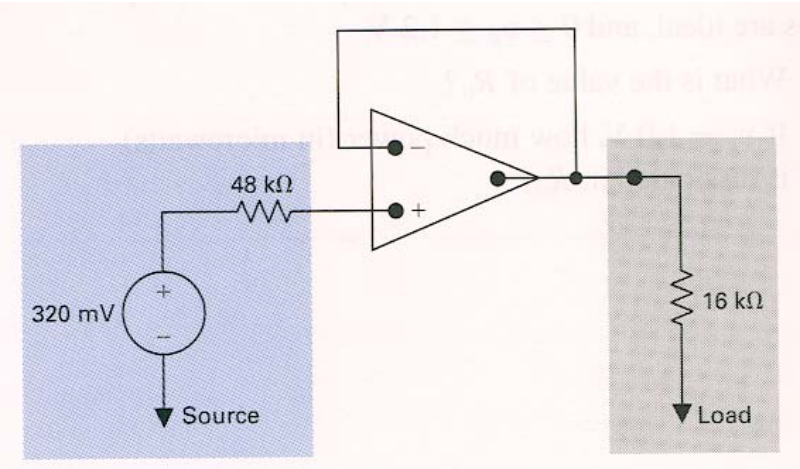
Homework Assignment #4

Due at 11 AM in 240 Cory on Friday, 9/26/03

* Be sure to put your name and **Discussion Section number** on your paper; **otherwise 5 pts will deducted from your score!**

Problem 1: Voltage Follower

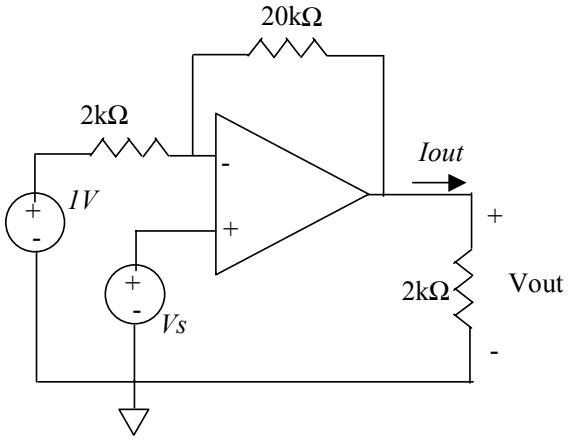
Assume that the ideal op amp in the circuit below is operating in its linear region.



a) Calculate the power delivered to the 16 kΩ load resistor
b) Repeat (a) with the op amp removed from the circuit, that is, with the 16 kΩ resistor connected directly in series with the voltage source and the 48 kΩ resistor.
c) What is the ratio of the power found in (a) to that found in (b)?
d) Does the insertion of the op amp between the source and the load serve a useful purpose? Explain.

Problem 2: Ideal Op Amp Circuit Analysis

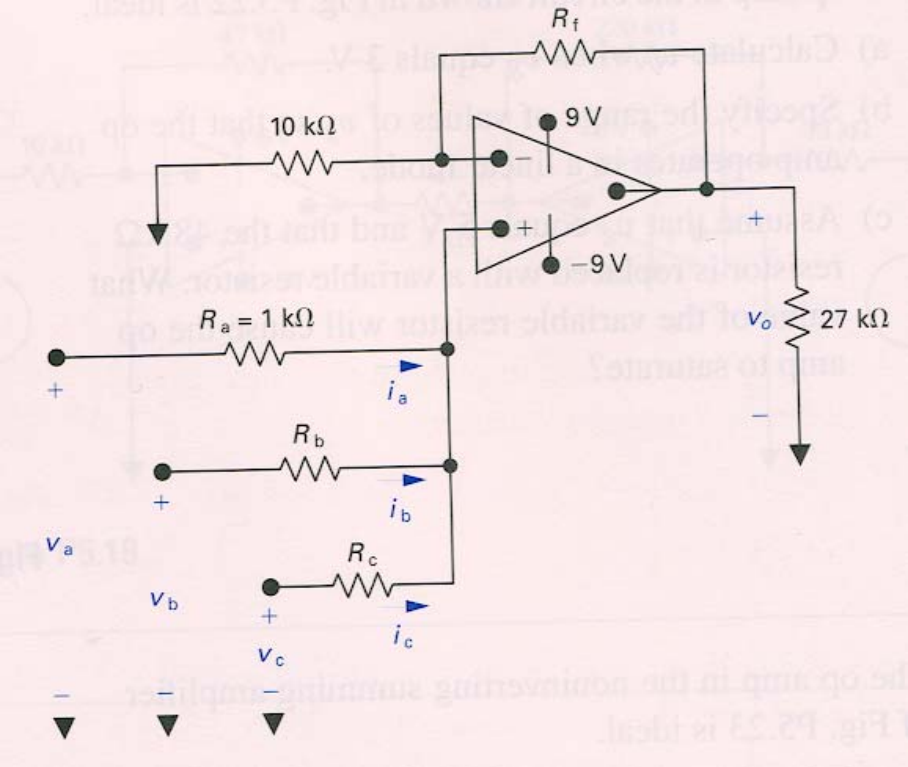
Given the following circuit:



a) Find V_{out} as a function of V_s, assuming that the op amp is ideal and operating in its linear region.
b) Due to supply voltage limitations, $0V \leq V_{out} \leq 10V$. Plot V_{out} *vs.* V_s.

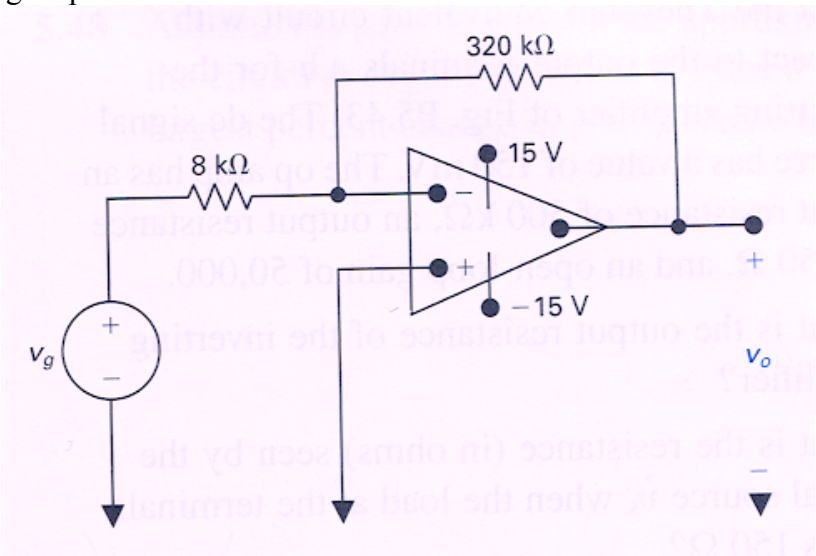
Problem 3: Non-Inverting Summing Amplifier Circuit Design

Assume the op amp in the circuit below is ideal and operating in the linear region. Design the circuit so that $v_o = 4v_a + 2v_b + v_c$. (Specify the numerical values of R_b, R_c, and R_f.)



Problem 4: Realistic Op Amp

Consider the inverting amplifier circuit below.



The op amp has input resistance R_i = 400 kΩ, output resistance R_o = 2 kΩ, open-loop gain A = 500,000. Assume that the op amp is operating in its linear region. **Also suppose that the amplifier is loaded with a 1 kΩ resistor.**

a) Calculate the voltage gain (v_o/v_g) of the amplifier.

b) Repeat **(a)** assuming the op amp is ideal.