CASE WESTERN RESERVE UNIVERSITY
Case School of Engineering
Department of Electrical Engineering and Computer Science

ENGR 210. Introduction to Circuits and Instruments (4)

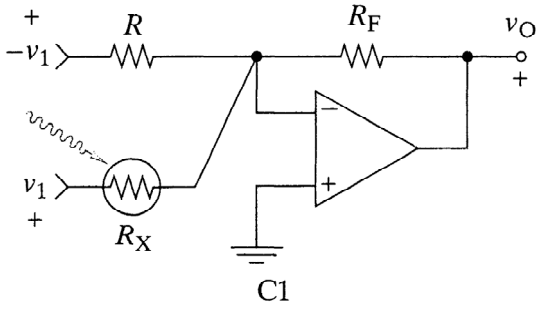
Makeup Homework Set No. 1 Issued 3/31/05
Due 4/15/05

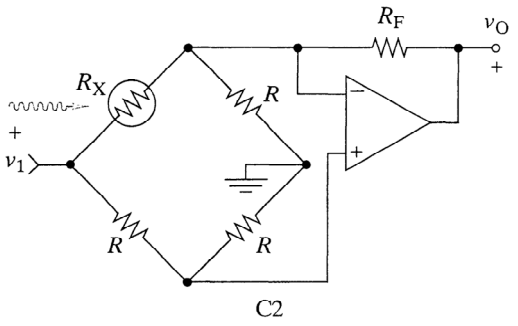
POSSIBLE TOPICS FROM HOMEWORKS 5-8:
LINEARITY — PROPORTIONALITY
LINEARITY — SUPERPOSITION
THEVENIN AND NORTON EQUIVALENT CIRCUITS
MAXIMUM SIGNAL TRANSFER
INTERFACE DESIGN
LINEAR DEPENDENT SOURCES
COMPARISON OF ANALYSIS METHODS
EQUIVALENT CIRCUITS WITH LINEAR DEPENDENT SOURCES
BASIC OP-AMP CIRCUITS
MULTIPLE OP-AMP CIRCUITS

Interface Design

1) (5 pts)

Both circuits below contain a photoresistor Rx whose resistance varies inversely with the intensity of the incident light. In complete darkness its resistance is 10 kΩ. In bright sunlight its resistance is 2kΩ. At any given light level the circuit is linear, so its input-output relationship is of the form $v_o=Kv_1$.





(a) For circuits C1 and C2 determine the constant K in terms of circuit parameters.

(b) For circuit C1 with v1=+15 volts, select the values of R and R_F so that v_o=-10 volts in bright sunlight and +10 volts in complete darkness.

(c) Repeat part (b) for circuit C2.

(d) Evaluate the two designs by comparing the number of devices required and the total power dissipated.

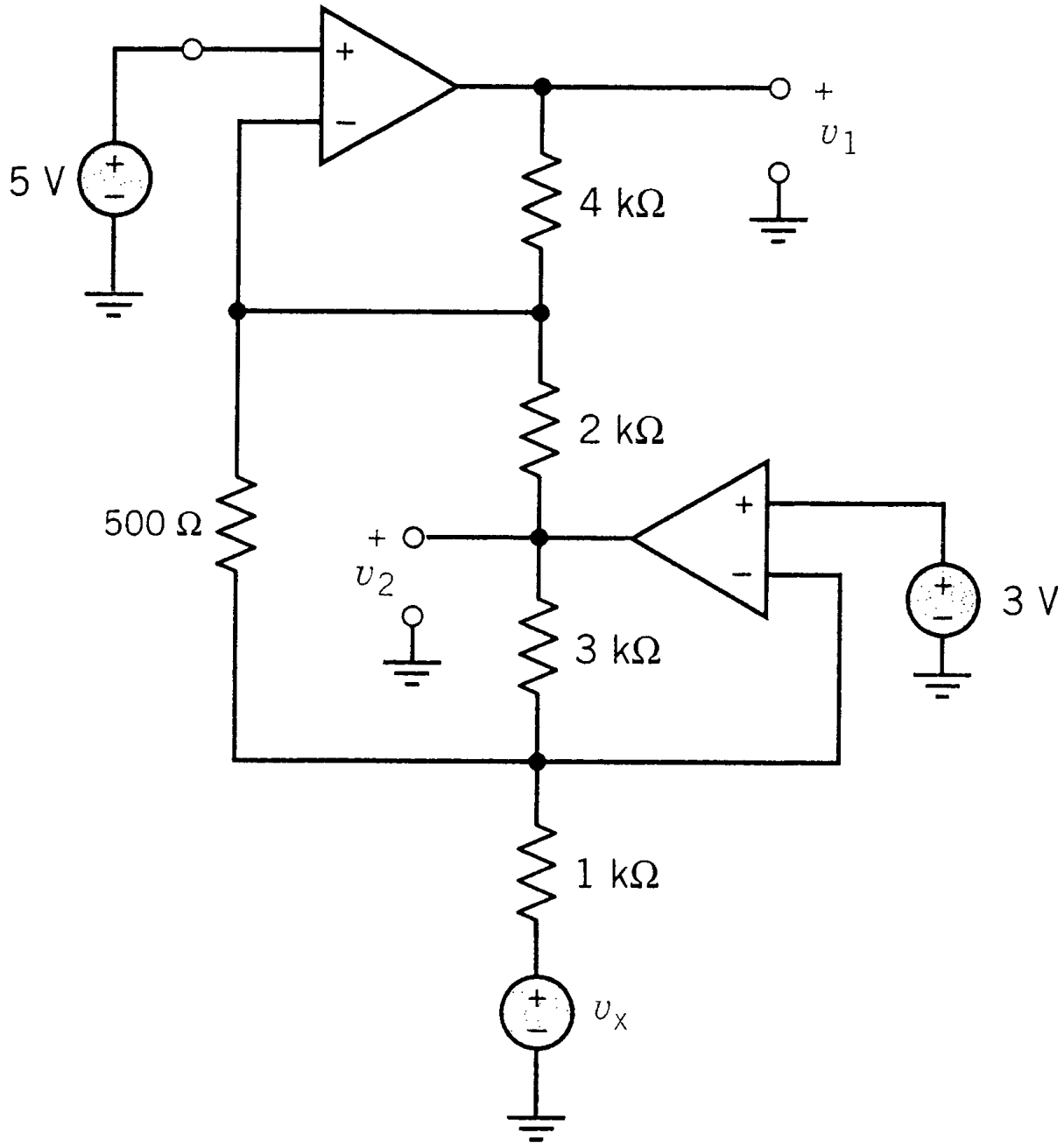
Multiple Op Amp Circuits

(5 points) **Problem 2**

Assuming that v_x=1 volt determine the voltages v_1 and v_2 with respect to ground.

V_1=_____ volts

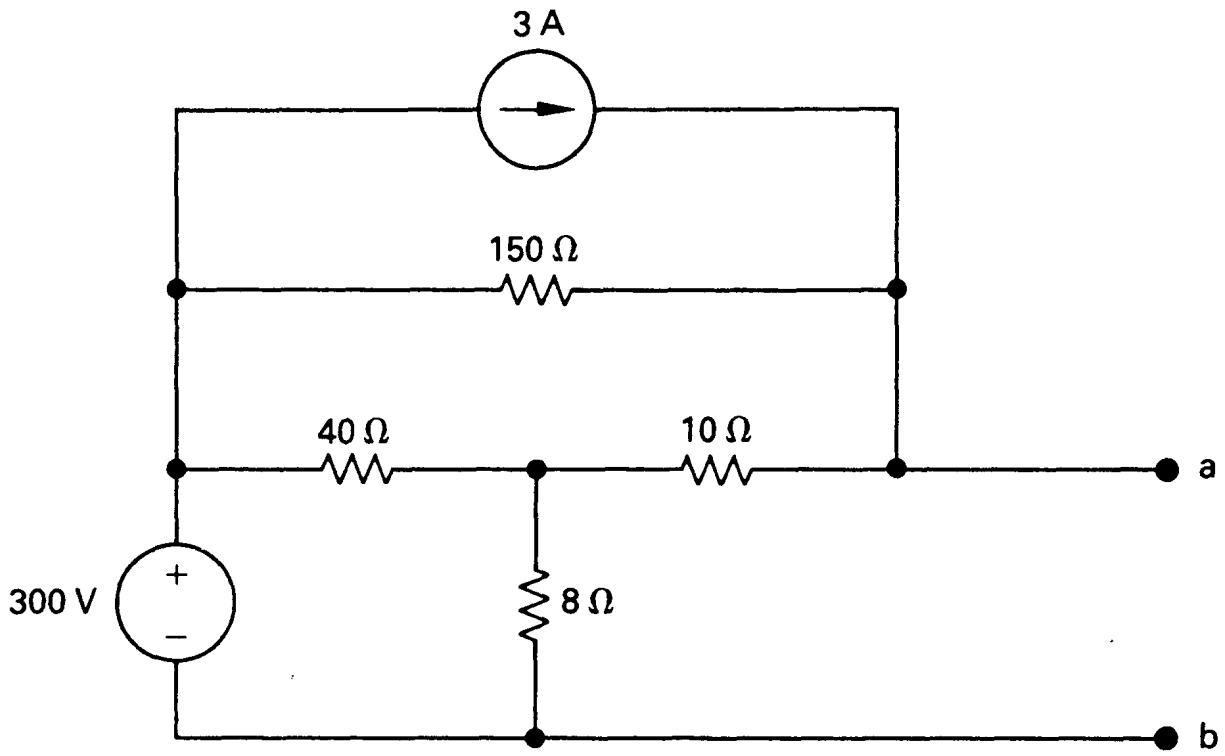
V_2=_____ volts



THEVENIN AND NORTON EQUIVALENT CIRCUITS

3) (5 pts)

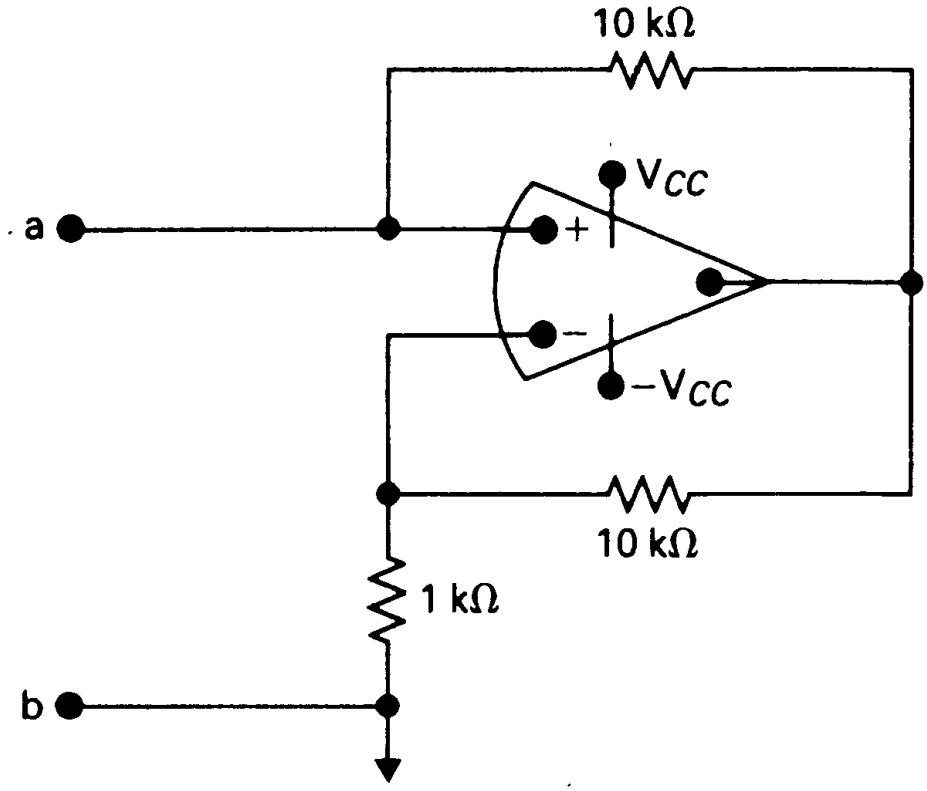
Find the Thevenin equivalent circuit with respect to the terminals a,b for the circuit shown below.



THEVENIN AND NORTON EQUIVALENT CIRCUITS

4) (5 pts)

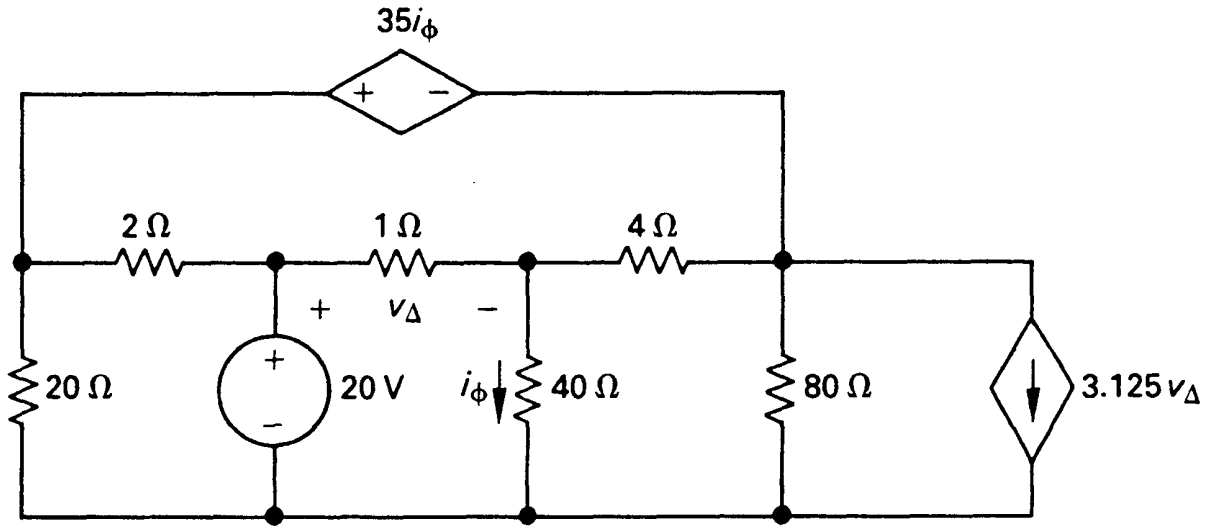
Find the Thevenin equivalent circuit with respect to the terminals a,b for the circuit shown below if the operational amplifier is ideal.



Node/Mesh circuit analysis

5) (5 pts)

Use the node voltage method to find the power supplied by the 20 volt source in the circuit shown below.



NOTE: Please put your section code AND your CWRU e-mail next to your name at the top of the page. Section codes are

MA (Monday Afternoon)
ME (Monday Evening)
TA (Tuesday Afternoon)
TE (Tuesday Evening)
WA (Wednesday Afternoon)
WE (Wednesday Evening)