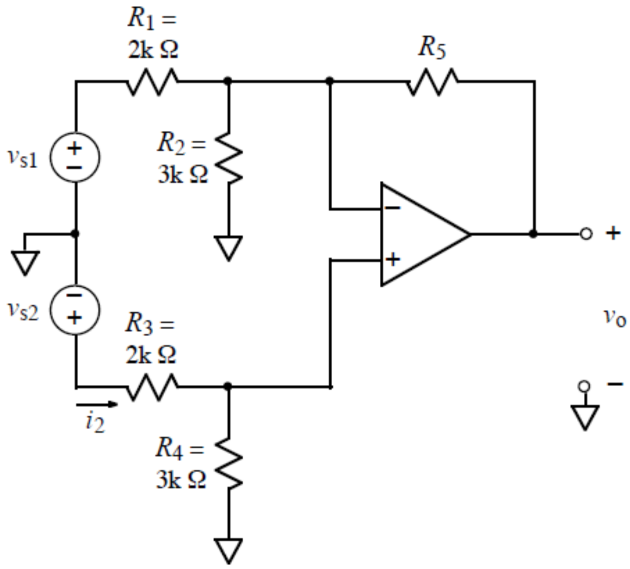
(Each problem is worth double points)

1.



The above circuit operates in linear mode. Derive a symbolic expression for v_o. The expression must contain not more than the parameters v_{s1}, v_{s2}, R_1, R_2, R_3, R_4, and R_5.

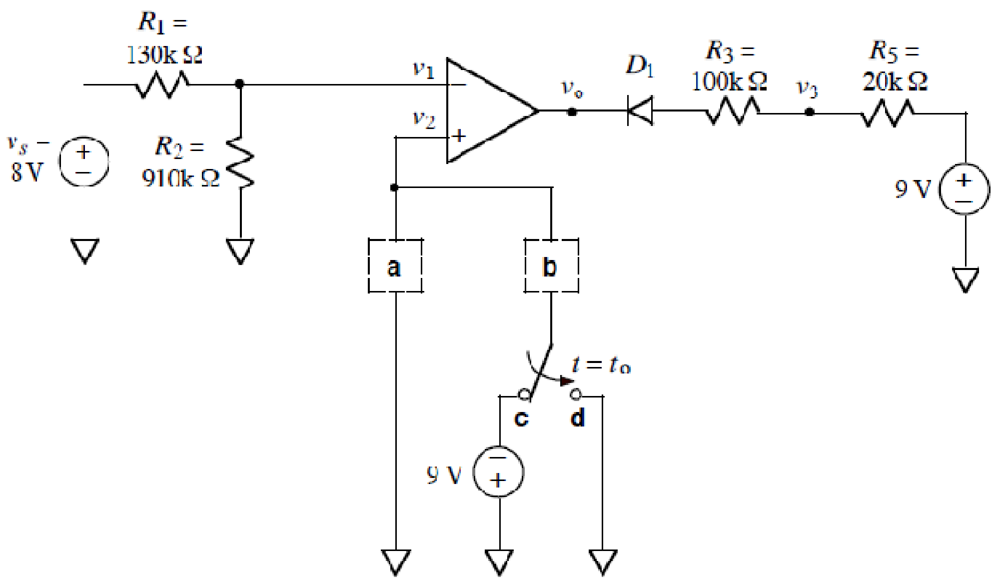
2. Using the solution for Problem 1: if $v_{s1} = 0$ V and $v_{s2} = 1$ V, find the value of R_5 that will yield an output voltage of $v_o = 1$ V.

3. Using the circuit in Problem 1: Find the numerical value of the circuit's input resistance, R_{in}, as seen by source v_{s2}. In other words, write a formula for voltage, v_{s2}, divided by i_2:

$$R_{in} \equiv \frac{v_{s2}}{i_2}$$

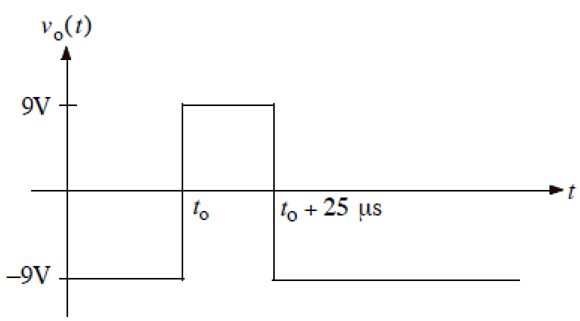
Write R_{in} in terms of not more (and possibly less) than R_1, R_2, R_3, R_4, and R_5.

4.



Rail Voltages=±9

After being at **c** for a long time, the switch moves to **d** at time $t = t_o$.



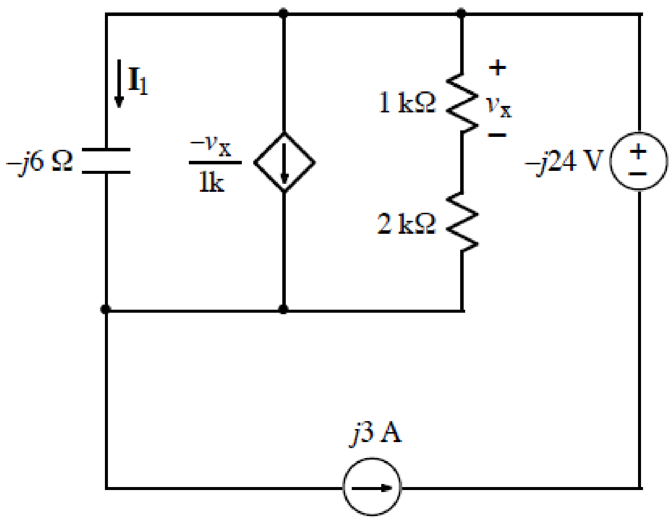
a) Choose either an R or C to go in box **a** and either an R or C to go in box **b** to produce the v_o(t) shown above. Use at least one R, and use 2 kΩ for the R value or values. Also, note that v_o stays low forever after t_o + 25 μs. Specify which element goes in each box and its value.

5. Sketch $v_1(t)$, showing numerical values appropriately.

6. Sketch $v_2(t)$, showing numerical values appropriately.

7. Sketch $v_3(t)$. Show numerical values for $t < t_o$, for $t_o < t < t_o + 25$ μs, and for $t > t_o + 25$ μs. Use the ideal model of the diode: when forward biased, its resistance is zero, (a wire); when reverse biased, its resistance is infinite, (an open).

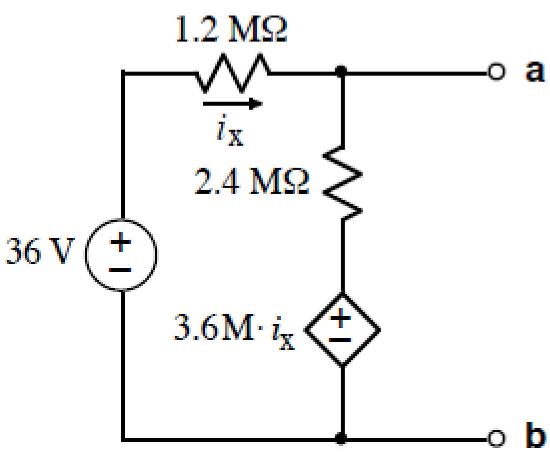
8.



A frequency-domain circuit is shown above. Write the value of phasor current $\mathbf{I}_1$ in rectangular form.

9. Given ω = 25k rad/s, write a numerical time-domain expression for $i_1(t)$, the inverse phasor of $\mathbf{I}_1$.

10.



(a) If we attach R_L to terminals **a** and **b**, find the value of R_L that will absorb maximum power.

(b) Calculate the value of that maximum power absorbed by R_L.