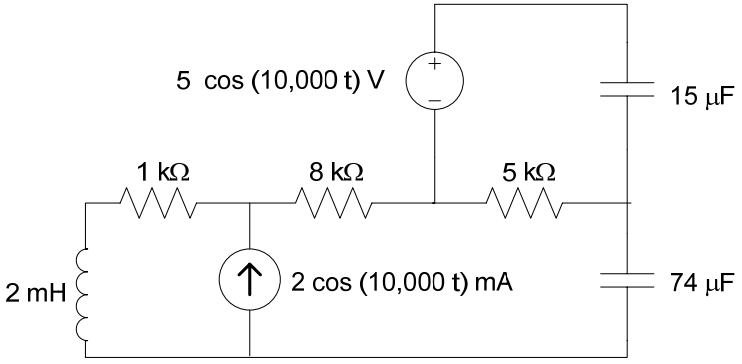
**Problem 1:**

Find the sinusoidal steady-state current through the 1,000 ohm resistor in the circuit below. Be sure to indicate on the circuit diagram the *direction* of the current that corresponds to your answer.

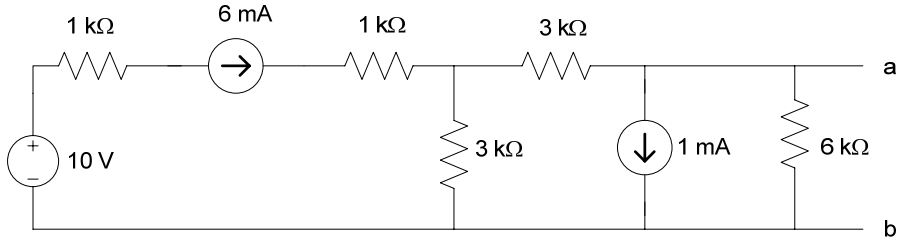
Solve the problem two times, once using node-voltage analysis and once using mesh-current analysis. Use a supernode and supermesh when needed, and make sure you can solve simultaneous linear equations with complex numbers. Show all of your work and indicate where you obtained answers from your calculator.




**Problem 2:**

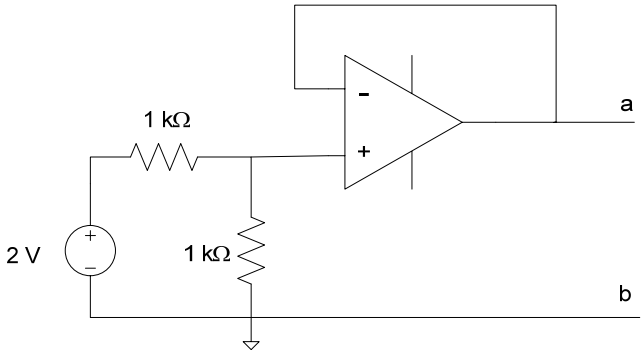
Find the Thevenin equivalent with respect to terminals a, b in the circuit below.

Solve for the Thevenin equivalent using any method you would like, and then repeat the analysis using **source transformations** to obtain the Thevenin equivalent.

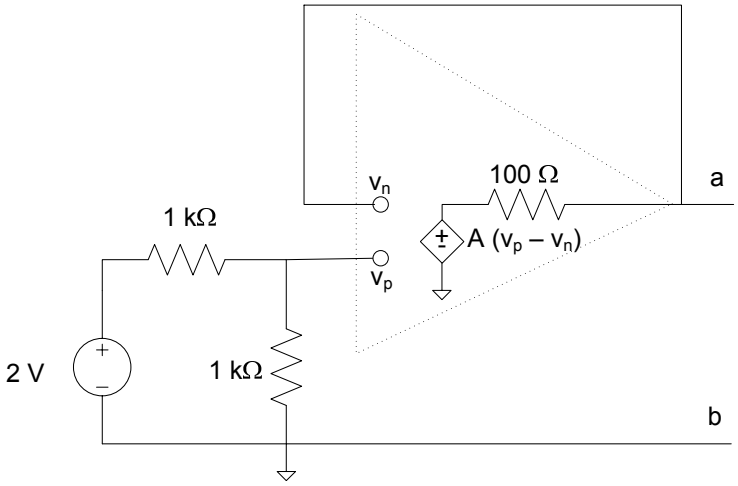


**Problem 3:**

(a) If the op amp is *ideal* and operating linearly, what is the Thevenin equivalent circuit with respect to terminals *a* and *b* in the circuit below?




(b) Next we consider the same circuit with a more realistic model for the op amp, as shown below. Find the Thevenin equivalent circuit with respect to terminals *a* and *b*. Your Thevenin model should be a function of the op amp gain, *A*.




(c) Use your Thevenin model from part (b) to find the voltage across a 100 ohm load resistor that is attached between terminals *a* and *b*. Assume that the op amp gain $A = 1{,}000$.

(d) How much power is drawn from the 2 V source?
How much power is delivered to the 100 ohm load resistor in part (c)?