1. Solve the following circuit for the node x_1 and the currents y_1, y_2 and y_3. Use the Fundamental Equation (7) from your textbook to solve first for x and then for the vector y. The voltage sources $\mathbf{b} = (b_1, b_2, b_3)$ are shown in the circuit. The circuit does not have any current sources f, but ammeters are provided that give you the solution to the currents y_1 and y_2. You should use these current values only to check your answers, not to obtain the solution. Note the ammeter currents are given in $mA = 0.001A$. Your solution will be given in A (Amperes). You should be able to do

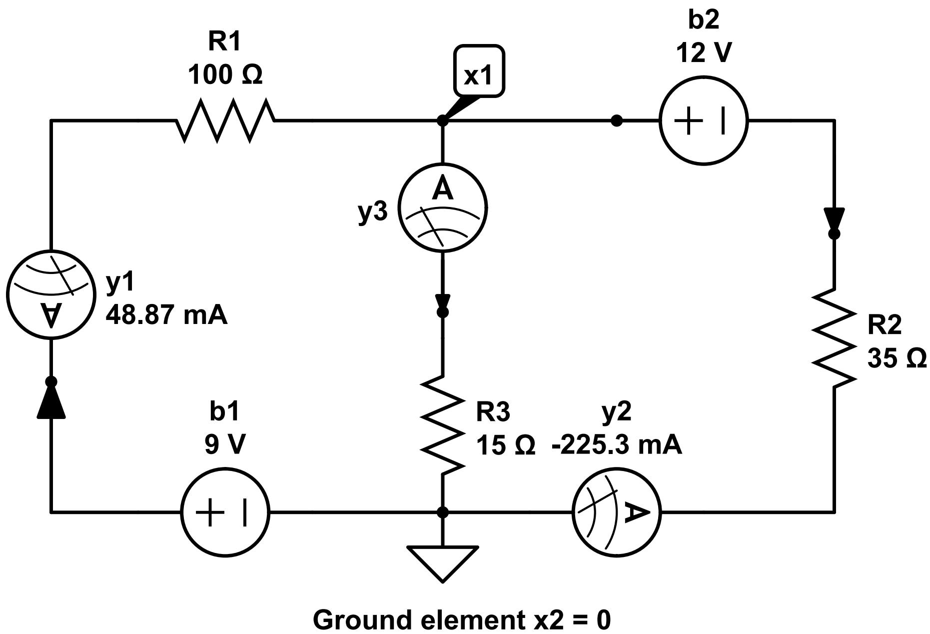

Figure 1: Circuit for problem Problem 1.

the calculations with a calculator, but you may also use Matlab or some other matrix program. In any case, you must show the matrix A you construct, the equations that you solved, and provide your node and current solutions to four digits of accuracy.

This circuit was designed in Circuit Lab (www.circuitlab.com). Feel free to sign up for a (free) account, replicate and solve this circuit online and check your solution.

2. Problem set §2.5, exercises 1, 2, 6, 8, and 10.

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3. For each problem, let V be the space spanned by the given vectors. Find a basis for the orthogonal complement of V.

   (a) Find a basis for the orthogonal complement of the vector: $\begin{bmatrix} 2 \\ -1 \\ \frac{1}{2} \end{bmatrix}$.

(b) Find a normal vector for the plane spanned by the two vectors: $\begin{bmatrix} 1 \\ 3 \\ 4 \end{bmatrix}, \begin{bmatrix} 5 \\ 2 \\ 7 \end{bmatrix}$.

(c) Find a basis for the plane orthogonal to the plane spanned by the two vectors: $\begin{bmatrix} 1 \\ 2 \\ -5 \\ 8 \end{bmatrix}, \begin{bmatrix} -1 \\ -1 \\ 3 \\ -5 \end{bmatrix}$.

4. Imagine a matrix A such that the columns of A add up to the **0** vector, and the rows of A add up to the **1** vector (vector of all 1's). Show that this is impossible!

5. Problem set §3.1, exercises 5, 26, 27, 32, and 40