Nodal Analysis Procedure

1. Select reference node (usually one end of a voltage source); mark with ground 0V symbol
2. Label node voltages (implied with respect to 0V reference)
3. Label element currents
4. Write KCL equation at each node
5. Write element V-I constraints (may eliminate some "unknowns")
6. Solve system of equations

If circuit is properly defined, procedure will always work

NO V LOOPS          HAND OFF
NO I ONLY AT A NODE  TO SPICE,...
1. REF NODE: BOTTOM OF 10V SOURCE
2. LABEL NODE VOLTAGES
3. ELEMENT CURRENTS (PASSIVE)
4. KCL AT EACH NODE
   a. \( i_1 + i_2 + i_5 = 0 \)
   b. \( i_2 = i_3 + i_4 \) OR \( i_2 - i_3 - i_4 = 0 \)
5. ELEMENT CONSTRAINTS: OHM'S LAW
   \[ i_1 = \frac{V_a - 0}{R_1} \]
   \[ i_2 = \frac{V_a - V_b}{R_2} \]
   \[ i_3 = \frac{V_b - 0}{R_3} \]
   \[ i_4 = \frac{V_b - 0}{R_4} \]
6. ONLINE

10V SOURCE
   \( i_5 = ? \) ANYTHING FOR V SOURCE!
   \( V_a = +10V \) KNOW ✓