Name (please print)______________________________________________________________

In keeping with the Honor Code, I have neither provided nor received any assistance on this test. I understand if it is later determined that I gave or received assistance, I will fail the class and will be brought before the Undergraduate Judicial Board.

Signature:_____________________________________________________________________

Problem I: [15 pts] Element Table

Fill in the table below. For the Equation column, you can put any equation for the given variable in terms of other variables.

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Units</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>charge</td>
<td>(blank)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>work</td>
<td></td>
<td>(blank)</td>
<td></td>
</tr>
<tr>
<td>voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>power</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>resistance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>conductance</td>
<td></td>
<td></td>
<td>(blank)</td>
</tr>
</tbody>
</table>
Problem II: [15 pts] Basic Circuit Relationships

Given the following circuit:

![Circuit Diagram]

and known values \( i_a, i_b, v_m, v_n, R_1, R_2, \) and \( R_3 \), find the following quantities in terms of the known values:

1. \( i_x \)

2. \( v_y \)

3. \( P_{abs,v_n} \)

4. \( P_{\text{abs},R_1} \)

5. \( P_{\text{abs},R_3} \)

6. \( P_{\text{abs},i_a} \)
Problem III: [30 pts] Node Voltage Method

Given the following circuit:

![Circuit Diagram]

and known values $v_s$, $b$, $R_1$, $R_2$, $R_3$, and $R_4$, find $v_y$ in terms of the known values using the Node Voltage Method.
Problem IV: [30 pts] Mesh Current Method

Given the following circuit:

and known values $i_s$, $g$, $R_1$, $R_2$, $R_3$, and $R_4$, find $p_{abs.R_4}$ in terms of the known values using the Mesh Current Method. 

*Hint: use the two simple-source equations first to get a single equation for the unknown current in the tallest mesh.*
Problem V: [10 pts] Cramer’s Rule

Given the following set of three linear equations:

\[ x + 5y - 7z = 10 \]
\[ -8x - 2y + 3z = 11 \]
\[ 6x + 9y - 4z = 12 \]

(1) Write the system as a matrix equation

(2) Set up, but do not solve, what you would need to do to find the value of the variable \( y \)