Special Problem 4.5-2

A transmission line of length \( l = \lambda/2 \) is connected between port 2 and port 3 of a three-port network.

The power incident on port 1 is \( P_1^+ = 9\,mW \).

\[ P_1^+ = 9\,mW \]

The network has a scattering matrix:

\[
S = \begin{bmatrix}
0 & \frac{1}{2} & \frac{1}{2} \\
\frac{1}{2} & 0 & \frac{1}{2} \\
\frac{1}{2} & \frac{1}{2} & 0
\end{bmatrix}
\]

Use signal flow graph techniques (you must use a signal flow graph!) to help you determine the power exiting port 1 (i.e., \( P_1^- \)).

Start by drawing the signal flow graph with the nodes shown on the next page.
Carefully note the arrangement of these nodes (trust me, they make sense)!

\[ \begin{array}{ccc}
  b_2 & a_1 & b_3 \\
  a_3 & b_1 & a_2 \\
\end{array} \]