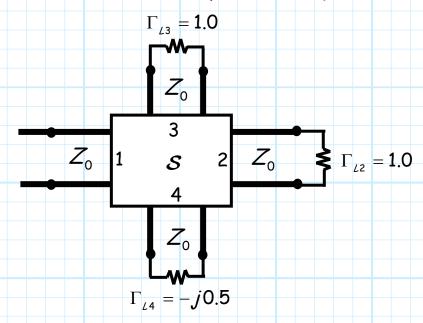**Special Problem 4.5-6**

Three **loads** are connected to a non-reciprocal, **four-port** device.

The four-port device has the **scattering matrix**:

$$S = \begin{bmatrix} 0 & 0 & 0 & 0.7 \\ 0 & 0.5 & 0.8 & 0 \\ 0.25 & 0 & 0 & 0 \\ 0.2 & 0.5 & 0 & 0 \end{bmatrix}$$

1. Using the **nodes provide on the next page**, carefully and completely **draw** this signal flow graph of this network, including the **value** and **direction** of each and every (non-zero) **branch**.

2. Reduce this signal flow graph and determine the **total voltage** across the **load at port 4** if $a_1 = 2.0$.

b_3

a_3

a_1

b_2

b_1

a_2

a_4

b_4