1. Consider a network with driving-point impedance $Z$
   a. Find expressions for $P$ and $Q$
   b. Given $i(t) = \sqrt{2}|I|\cos \omega t$, find $p(t)$ in terms of $P$ and $Q$
   c. Suppose that the network is a series RLC. Interpret the results in part b).
   d. Find the condition that $Q$ is zero.

![Figure 1](image-url)
2. In the following figure, assume that

\[ |V_1| = |V_2| = 1.0 \quad Z_{\text{line}} = 0.1 \angle 85^0 \]

a. For what nonzero \( \theta_{12} \) is \( S_{12} \) purely real?
b. What is the maximum power, \(-P_{21}\), that can be received by \( V_2 \), and at what \( \theta_{12} \) does this occur?
c. When \( \theta_{12} = 85^0 \), what is the active power loss in the line?
d. For what \( \theta_{12} \) is \(-P_{21}\) = 1?
3. Refer to Figure 3 and assume that $Z = 100 \angle 60^0$, $V_{ab} = 208 \angle 0^0$.
   a. If the circuit is balanced positive sequence (abc), find $V_{bc}$, $V_{ca}$, $I_a$, $I_b$, and $I_c$.
   b. Draw the picture of the above calculated phasors.

![Figure 3](image-url)