H1.1) For the following circuit, \( v_1(t) = 120 \cos(\omega t + 0^\circ) \), \( v_2(t) = 120 \sin(\omega t + 60^\circ) \) and \( Z_{12} = 0.5 + j0.5 \Omega \).

a) Convert \( v_1(t) \) and \( v_2(t) \) to their phasor equivalents \( V_1 \) and \( V_2 \). According to the "sign convention" used to label the current and sources, classify the two sources as "active" or "passive."

b) Calculate \( I_{12} \).

c) Calculate the complex power \( S \) consumed by source 2.

d) Calculate the complex power \( S \) produced by source 1.

e) In terms of generator or load, what are sources 1 & 2? Was the correct guess made in labeling current direction?

f) What is the power factor of source 2?
EE 380 - HMWK H1.1

a) $V_1(t) = 120 \cos (\omega t + 60^\circ)$ \iff $\bar{V}_1 = 84.85 \angle 0^\circ \ V$

$V_2(t) = 120 \sin (\omega t + 60^\circ)$ \iff $\bar{V}_2 = 84.85 \angle -30^\circ \ V$

$V_1$ is active, $V_2$ is passive

b) $\bar{I}_{12} = \frac{\bar{V}_1 - \bar{V}_2}{0.5 + j0.5} = \frac{62.11 \angle 30^\circ \ A}{0.5 + j0.5}$

c) $\bar{S}_{2,IN} = \bar{V}_2 \bar{I}_{12}^* = (84.85 \angle -30^\circ) (62.11 \angle 30^\circ)^*$

$= 5270 \angle -60^\circ \ VA$

$= 2635 - j4564$

\[ \begin{array}{c}
\text{P} \\
\text{Q}
\end{array} \]

\[ \begin{array}{c}
-60^\circ \\
\theta
\end{array} \]

\[ s \\
\]

\[ \]

d) $\bar{S}_{1,OUT} = \bar{V}_1 \bar{I}_{12}^* = (84.85 \angle 0^\circ) (62.11 \angle -30^\circ)$

$= 5270 \angle -30^\circ$

$= 4563 - j2635$

e) V_1 = GEN ? \ . \ Guessed \ right \ on \ labeling.$

$V_2 = LOAD$

f) PF is defined in terms of passively labeled circuit element. For $V_2$, in part c), $\Theta = -60^\circ$

$\Rightarrow PF = 0.5 \ \text{LEAD}$

Note: $\bar{S}_1 - \bar{S}_2 = 1928 + j1928 \ VA$

$= \bar{S} \ \text{consumed by } Z_{12}$