The magnitude of the line voltage at the terminals of a balanced Y-connected load is 12,800 V. The load impedance is 216+j63 Ω/Ø. The load is fed from a line that has an impedance of 0.25+j2 Ω/Ø. Assume the sequence is positive.

a) If $V_{AB}$ is the reference voltage, what is $V_{BC}$ and $V_{CA}$

\[
V_{AB} = 12,800 \, V \quad 0^\circ \quad \Rightarrow \quad V_{BC} = 12,800 \, V \quad -120^\circ \quad V
\]

\[
V_{CA} = 12,800 \, V \quad +120^\circ \quad V
\]

b) Find $V_{AN}$.

\[
V_{AB} = \sqrt{3} \quad V_{AN} \quad 60^\circ \quad \Rightarrow \quad V_{AN} = \frac{V_{AB}}{\sqrt{3}} = 12,800 \, V \quad -30^\circ
\]

\[
V_{AN} = \frac{7390.08}{\sqrt{3}} \quad V
\]

c) What is the magnitude of the line current?

\[
I_{aA} = \left| \frac{V_{AN}}{216+j63} \right| = \left| \frac{12,800 \, V \quad -30^\circ}{(\sqrt{3})(216+j63)} \right|
\]

\[
|I_{aA}| = 32.845 \, A
\]

d) What is the magnitude of the line voltage at the source?

\[
|V_{an}| = |I_{aA} \left( 32 + 0.25 + 216 + j63 \right) | = |I_{aA} \left( 216.25 + j65 \right) | = 7416.61 \, V
\]

\[
|V_{ab}| = \sqrt{3} \, |V_{an}| \quad L_\circ \quad = \sqrt{3} \, |V_{an}|
\]

\[
|V_{ab}| = 12,845.94 \, V
\]