The magnitude of the line voltage at the terminals of a balanced Y-connected load is 4,160 V. The load impedance is $72 + j21 \ \Omega / \Omega$. The load is fed from a line that has an impedance of $0.08 + j0.7 \ \Omega / \Omega$.

a) What is the magnitude of the line current?

$$I_{aA} = \frac{4160}{\sqrt{3}} \frac{72 + j21}{75} \approx 32 \ \angle -16.26^\circ$$

$$|I_{aA}| = 32 \ \text{A}$$

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

$$V_{an} = \frac{4160}{\sqrt{3}} + (32 \angle -16.26^\circ)(0.08 + j0.7)$$

$$= 2410.78 + 22.55 \angle 167.22^\circ$$

$$= 2410.51 + j20.79$$

$$= 2410.6 \ \angle 0.49^\circ$$

$$|V_{AB}| = \sqrt{3} (2410.6) = 4174.24 \ \text{V}$$