

$$Z = (R) + i(X)$$

$$Z = ((20) + i(7.3313)) \Omega$$

$$|Z| = \sqrt{(\text{Real})^2 + (\text{Imag})^2}$$

$$= \sqrt{(20)^2 + (7.3313)^2}$$

$$\Rightarrow |Z| \approx 21.30$$

$$\theta = \tan^{-1} \left( \frac{\text{Imag}}{\text{Real}} \right) = \tan^{-1} \left( \frac{7.3313}{20} \right)$$

Circuit Impedance

$$\Rightarrow \theta = 20.13^\circ$$

$$\Rightarrow Z = [20 + i(7.3313)] \Omega = (21.30 \angle 20.13^\circ) \Omega$$

$$V = IZ$$

$$\Rightarrow I = \frac{V}{Z} = \frac{(100 \angle 0^\circ) V}{(21.30 \angle 20.13^\circ) \Omega}$$

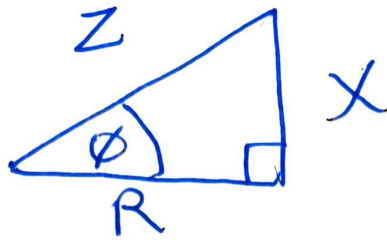
$$\Rightarrow I = (4.6948 \angle -20.13^\circ) A$$

$$\Rightarrow I \approx (4.69 \angle -20.13^\circ) A$$

Circuit Current

$$V = (100 \angle 0^\circ) V$$

Circuit Voltage



$$PF = \cos(\phi) = \cos \left( \begin{array}{c} \text{Voltage} \\ \text{Angle} \end{array} - \begin{array}{c} \text{Current} \\ \text{Angle} \end{array} \right)$$

$$= \cos \left( 0^\circ - (-20.13^\circ) \right)$$

$$= \cos(+20.13^\circ)$$

$$\Rightarrow PF = 0.9389 \approx 0.94$$

$$\Rightarrow \boxed{PF \approx 0.94} \quad \Leftarrow \text{Lagging}$$

current "lags" behind voltage  $\Leftarrow$  because current angle is less than voltage angle

Another way to find PF:

$$PF = \cos(\phi) = \frac{R}{|Z|} = \frac{(20)}{21.30} = 0.93896$$

$$\Rightarrow \boxed{PF \approx 0.94}$$