Power Factor

Again, for a linear circuit with sinusoidal input and an output which has reached the steady-state,

Average power absorbed = $P_{av} = \dfrac{V_m I_m}{2} \cos(\phi - \theta)$

Aparent power = $|\underline{S}| = \dfrac{V_m I_m}{2}$

Recall that $v(t) = V_m \cos(\omega_o t + \phi)$, $i(t) = I_m \cos(\omega_o t + \theta)$

The power factor, or power factor angle is

$$pf = \dfrac{P_{av}}{|\underline{S}|} = \cos(\phi - \theta) = \cos(\theta - \phi)$$

Hence $\qquad P_{av} = \dfrac{V_m I_m}{2} \, pf$

* Since $\cos(\cdot)$ is even, given a power factor we cannot tell whether $\phi - \theta > 0$ or $\phi - \theta < 0$. We need more information

* The power factor is said to be leading when $\phi - \theta < 0$ and lagging when $\phi - \theta > 0$