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**EXERCISE 2.7:** Show that the following representation can be derived for the real sine signal:

$$A \sin(\omega_0 t + \varphi) = \frac{1}{2} X e^{-j\pi/2} e^{j\omega_0 t} + \frac{1}{2} X^* e^{j\pi/2} e^{-j\omega_0 t}$$

where  $X = A e^{j\varphi}$ . In other words, the sine signal is composed of two complex exponentials with the same positive and negative frequencies, but the complex coefficients multiplying the terms are different from those of the cosine signal. Specifically, the sine signal requires additional phases of  $\mp\pi/2$  applied to the complex amplitude  $X$  and  $X^*$ , respectively.

