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Prob. 19.4 - exponential forms for dynamic stress and strain

$$\begin{aligned} E^* &= \frac{\sigma_o^* e^{i\omega t}}{\varepsilon_o^* e^{i\omega t}} \\ &= \frac{\sigma'_o + i\sigma''_o}{\varepsilon'_o + i\varepsilon''_o} \\ &= \frac{\sigma_o e^{i\theta_\sigma}}{\varepsilon_o e^{i\theta_\varepsilon}} = \frac{\sigma_o}{\varepsilon_o} e^{i(\theta_\sigma - \theta_\varepsilon)} = \frac{\sigma_o}{\varepsilon_o} e^{i\delta} \\ &= \frac{\sigma_o \cos \delta}{\varepsilon_o} + i \frac{\sigma_o \sin \delta}{\varepsilon_o} \\ &= \frac{\sigma'_o}{\varepsilon_o} + i \frac{\sigma''_o}{\varepsilon_o} = E' + iE'' \end{aligned}$$

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