1. Convert the following complex numbers from rectangular form to polar form.
   (a) $3 - j4$
   (b) $-5 - j11$
   (c) $-10 + j10$
   (d) $5 + j10$

2. Simplify the following expressions, then convert the result to polar form.
   (a) $(3 - j4)(-5 - j11)$
   (b) $\frac{-10 + j10}{5 + j10}$

3. Convert the following complex numbers from polar form to rectangular form.
   (a) $10 e^{j\frac{\pi}{3}}$
   (b) $-5 e^{j30^\circ}$
   (c) $-2 e^{-j\frac{\pi}{2}}$
   (d) $4 e^{j135^\circ}$

4. Simplify the following expressions, then convert the result to rectangular form.
   (a) $(10 e^{j\frac{\pi}{3}})(-5 e^{j30^\circ})$
   (b) $\frac{-2 e^{-j\frac{\pi}{2}}}{4 e^{j135^\circ}}$

5. Find the total complex impedance (in $\Omega$) for the following circuit elements or combinations at an angular frequency $\omega = 1000 \text{ rad/s}$.
   (a) 100$\Omega$ resistor
   (b) 10mH inductor
   (c) 100$\mu$F capacitor
   (d) 200$\Omega$ resistor in series with a 5mH inductor
   (e) 500$\Omega$ resistor in series with a 50$\mu$F capacitor
   (f) 1k$\Omega$ resistor in series with a 2mH inductor in series with a 20$\mu$F capacitor
   (g) 200$\Omega$ resistor in parallel with a 5mH inductor
   (h) 10mH inductor in parallel with a 100$\mu$F capacitor

6. Given the following circuit with complex impedances, find the complex current $\vec{I}$ and the complex voltage $\vec{V}$.

![Circuit Diagram]

$12\angle45^\circ \text{ V}$

$4\Omega$

$\vec{I}$

$\vec{V}$
7. Find the complex current $\bar{I}$ using current division.

$$
\begin{align*}
10 \angle 60^\circ \text{ A} & \quad 1\Omega \\
\downarrow & \quad -j\sqrt{3} \Omega \\
\bar{I} & 
\end{align*}
$$

8. Find the complex current $\bar{I}$ and complex voltage $\bar{V}$, then find the corresponding time-domain current $i(t)$ and voltage $v(t)$. Hint: Start by converting the circuit shown below to its phasor equivalent to determine $\bar{I}$ and $\bar{V}$.

$$
\begin{align*}
200 \cos(1000t + 30^\circ) \text{ V} & \quad 100\Omega \\
\downarrow & \quad 0.1\text{ H} \\
\bar{V} & \quad \bar{I}
\end{align*}
$$