Homework 16

1. a) Find the real part of $z = e^{j\pi/2}$.

   b) Find the rectangular form of $e^{j\pi/2}$.

   c) Find the rectangular form of $5\angle 25° \cdot 8\angle 35°$

   d) Find the magnitude of $\left(\frac{j^3}{2+j4}\right)\left(\frac{30e^{j129°}}{2-j}\right)$.

   e) Find the polar (magnitude and angle) form of $\sqrt{2+\sqrt{3}} - j\sqrt{2-\sqrt{3}}$

2. Given $\omega = 10$k rad/s, for each of the following impedances, determine which of the following the impedance is from: a capacitor, an inductor, or a resistor. Also, find the value of that capacitor, inductor, or resistor. Recall that $z_R = R$, $z_L = j\omega L$, and $z_C = 1/j\omega C$.

   a) 1 kΩ

   b) $-j50$ Ω

   c) $j400$ Ω

   d) $-j2$ kΩ

   e) $j8$ kΩ

3. Derive a symbolic expression for the impedance of an R, an L, and a C in parallel at frequency ω. Rationalize the expression so the denominator is real.

4. Write phasors (in both $Ae^{j\phi}$ and $A\angle\phi$ notations) for each of the following signals:

   a) $v(t) = 4\cos(100t + 30°)$ V

   b) $i(t) = 7\sin(\omega t - 45°)$ mA

   c) $i(t) = 50\text{ nF} \cdot \frac{d}{dt} 4\cos(100t + 30°)$ V

   d) $v(t) = 17\ \mu\text{H} \cdot \frac{d}{dt} 7\sin(60t - 45°)$ mA

   e) $v(t) = 4\cos(100t + 30°)\text{ V} + 3\sin(100t - 150°)\text{ V}$

5. Given $\omega = 200$ rad/sec, write inverse phasors for each of the following signals:

a) $\mathbf{I} = 6e^{j45^\circ}$ A

b) $\mathbf{V} = j9$ V

c) $\mathbf{I} = -2$ A

d) $\mathbf{V} = 6(1 + j)e^{j45^\circ}$ V

e) $\mathbf{I} = e^{3+j45^\circ}$ A $= e^3 \angle 45^\circ$ A