Problem 1 Two waves, $y_1(t)$ and $y_2(t)$, have identical amplitudes and oscillate at the same frequency, but $y_2(t)$ leads $y_1(t)$ by a phase angle of $60^\circ$. If $y_1(t) = 4\cos(2\pi \times 10^3 t)$ write down the expression appropriate for $y_2(t)$ and plot both functions over the timespan from 0 to 2 ms. (5 points)

Problem 2 Derive the expression for the current flowing through an RL circuit that has a sinusoidal voltage input. Derive by first writing the differential equation for the circuit, and then using the Euler’s identity to transform the differential equation into phasor form (hint: the exact derivation that was done in class). (5 points)

Problem 3 (a) Find the phasors of the following time functions:
1. $i(t) = -2\cos(\omega t + 3\pi / 4)$
2. $v(t) = 5\cos(\omega t - \pi / 4)$
(b) Find the instantaneous time sinusoidal functions corresponding to the following phasors:
1. $-3 + j2$
2. $j$
3. $2e^{j3\pi / 4}$
(5 points)

Problem 4 Given vectors $\vec{A} = -1\hat{x} + 2\hat{y} + 5\hat{z}$ and $\vec{B} = 2\hat{x} + 3\hat{y} + -2\hat{z}$ find
a) $2\vec{A}$
b) $\vec{A} - 3\vec{B}$
c) $\vec{A} \cdot \vec{B}$
d) $\vec{A} \times \vec{B}$
e) $\vec{A} \cdot (\vec{A} \times \vec{B})$
(5 points)