# Solution of ECE 300 Test 9 F11

1. Reduce each expression to a complex number in polar form with an angle in the range $-180°$ to $+180°$. (Remember, the polar form is magnitude-angle and the magnitude cannot be negative.)

(a) $(5\angle 100°)^4 = 625\angle 400° = 625\angle 40°$

(b) $\dfrac{1}{-10+j7} = \dfrac{1}{12.207\angle 145°} = 0.0819\angle -145°$

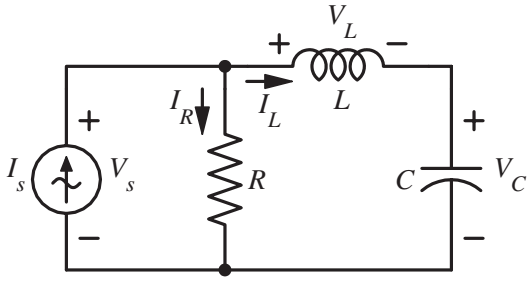
2. If $v_1(t) = 9\cos(200\pi t + 30°)$ and $v_2(t) = 18\sin(200\pi t - 110°)$, which sinusoid is leading and by how many degrees? (The numerical value of the angle in degrees must lie in the range $-180°$ to $+180°$.)

$v_1(t) = 9\cos(200\pi t + 30°)$ , $v_2(t) = 18\cos(200\pi t - 200°) = 18\cos(200\pi t + 160°)$

$v_2$ leads by $130°$

3. In the circuit below, if $I_L = 1\angle 0°$ find the numerical values of all the other phasor voltages and currents.

$Z_R = 150\Omega$ , $Z_L = j120\Omega$ , $Z_C = -j80\Omega$




$I_s = I_R + I_L = 1.035\angle 14.93°$ A $\quad I_R = V_s / R = 0.2667\angle 90°$ A

$V_s = V_L + V_C = j40 = 40\angle 90°$ V $\quad V_L = Z_L I_L = j120 = 120\angle 90°$ V $\quad V_C = Z_C I_L = -j80 = 80\angle -90°$ V

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1. Reduce each expression to a complex number in polar form with an angle in the range $-180°$ to $+180°$. (Remember, the polar form is magnitude-angle and the magnitude cannot be negative.)

(a) $\left(4\angle 110°\right)^4 = 256\angle 440° = 256\angle 80°$

(b) $\dfrac{1}{-7+j9} = \dfrac{1}{11.4\angle 127.88°} = 0.0877\angle -127.88°$

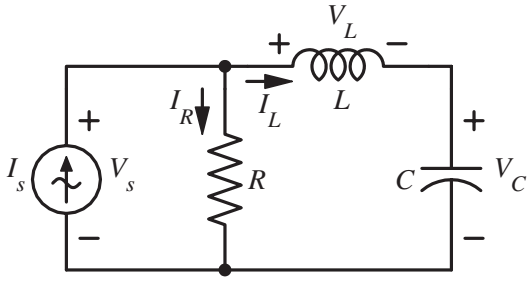
2. If $v_1(t) = 9\cos(200\pi t + 50°)$ and $v_2(t) = 18\sin(200\pi t - 100°)$, which sinusoid is leading and by how many degrees? (The numerical value of the angle in degrees must lie in the range $-180°$ to $+180°$.)

$v_1(t) = 9\cos(200\pi t + 50°)$ , $v_2(t) = 18\cos(200\pi t - 190°) = 18\cos(200\pi t + 170°)$

$v_2$ leads by $120°$

3. In the circuit below, if $I_L = 1\angle 0°$ find the numerical values of all the other phasor voltages and currents.

$Z_R = 120\Omega$ , $Z_L = j150\Omega$ , $Z_C = -j90\Omega$




$I_s = I_R + I_L = 1.118\angle 26.57°$ A $\quad I_R = V_s / R = 0.5\angle 90°$ A

$V_s = V_L + V_C = j60 = 60\angle 90°$ V $\quad V_L = Z_L I_L = j150 = 150\angle 90°$ V $\quad V_C = Z_C I_L = -j90 = 90\angle -90°$ V

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1. Reduce each expression to a complex number in polar form with an angle in the range $-180°$ to $+180°$. (Remember, the polar form is magnitude-angle and the magnitude cannot be negative.)

(a) $\left(3\angle 130°\right)^4 = 81\angle 520° = 81\angle 160°$

(b) $\dfrac{1}{-4+j7} = \dfrac{1}{8.062\angle 119.74°} = 0.124\angle -119.74°$

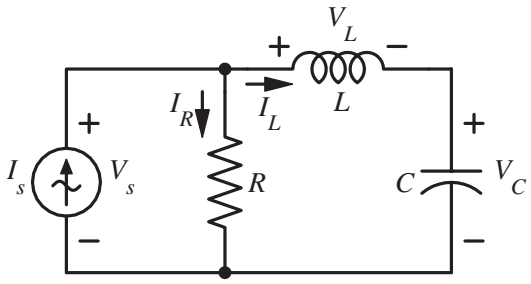
2. If $v_1(t) = 9\cos(200\pi t + 20°)$ and $v_2(t) = 18\sin(200\pi t - 140°)$, which sinusoid is leading and by how many degrees? (The numerical value of the angle in degrees must lie in the range $-180°$ to $+180°$.)

$v_1(t) = 9\cos(200\pi t + 20°)$ , $v_2(t) = 18\cos(200\pi t - 230°) = 18\cos(200\pi t + 130°)$

$v_2$ leads by $110°$

3. In the circuit below, if $I_L = 1\angle 0°$ find the numerical values of all the other phasor voltages and currents.

$Z_R = 70\Omega$ , $Z_L = j60\Omega$ , $Z_C = -j110\Omega$




$I_s = I_R + I_L = 1.229\angle -35.53°$ A $\quad I_R = V_s / R = 0.7143\angle -90°$ A

$V_s = V_L + V_C = -j50 = 50\angle -90°$ V $\quad V_L = Z_L I_L = j60 = 60\angle 90°$ V $\quad V_C = Z_C I_L = -j110 = 110\angle -90°$ V