

BME253L - Fall 2025
Problem Set #5 Solutions

Problem Number	Answer
1. Time-Dependent Signal Sources	Average = 2.5 RMS = 2.87
2. Phasors & Complex Numbers	a) $155 \angle -25^\circ$ $\omega = 377$ rad/s b) $5 \angle -130^\circ$ $\omega = 1000$ rad/s c) $24.18 \angle -71.93^\circ$ $\omega = 10$ rad/s d) $680 \angle -108^\circ$ $\omega = 500\pi$ rad/s
3. Polar Form	a) $4\sqrt{2} \angle 45^\circ$ b) $5 \angle 126.9^\circ$ c) $3.16 \angle 251.6^\circ$
4. V(t)	a) Use of $\cos(\omega t + \theta) = \cos\omega t \cos\theta - \sin\omega t \sin\theta$ $v(t) = 29.09 \cos(\omega t + 50.10^\circ) \text{ V}$ b) $v_1(t) = 10(\cos 30^\circ + j \sin 30^\circ) = 5\sqrt{3} + 5j$ $v_2(t) = 20(\cos 60^\circ + j \sin 60^\circ) = 10 + 10\sqrt{3}j$ $v(t) = 29.09 \angle 50.10^\circ \text{ V}$
5. Reactive Component	a) Inductor b) $L = 0.328$ mH
6. Z equivalent	a) $2240 - j297.5 \Omega$
7. Current Source	a) $13 \text{ mA} \angle 30^\circ$ b) $-2000j \Omega$ c) $26 \angle -60^\circ \text{ V}$
8. Kicad/spice	a) X-axis: frequency (10 Hz - 1 MHz) y-axis: gain (1.6 dB to -16.0 dB) Y-axis: phase angle (0 - 81°) Includes V_{out} magnitude and V_{out} phase Includes labels/legend b) X-axis: time (0 - 50 μs) y-axis : current (6.4 to -6.4 mA) Y-axis: voltage (-7.2 to 7.2 V)
