



PROBLEM:

Simplify the following complex-valued expressions. Reduce the answers to a **simple** numerical form.

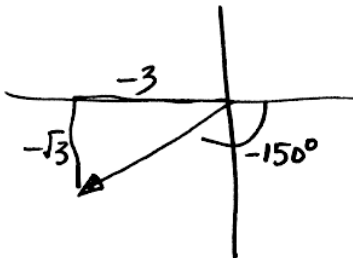
- (a) For $W = -3 + j\sqrt{3}$, express the conjugate W^* in **polar form**. In addition, **plot** W^* as a vector.
- (b) For $U = -1 + j$, express the inverse U^{-1} in **rectangular form**. In addition, **plot** U^{-1} as a vector.
- (c) For $Z = j(1 - j)^3$, express Z in **polar form**. In addition, **plot** Z as a vector.
- (d) For $V = 3je^{-j\pi/3}$, express $\Re\{Ve^{j7\pi t}\}$ as a sinusoid in the standard “cosine” form.



Simplify the following complex-valued expressions. Reduce the answers to a simple numerical form.

- (a) For $W = -3 + j\sqrt{3}$, express the conjugate W^* in polar form. In addition, plot W^* as a vector.

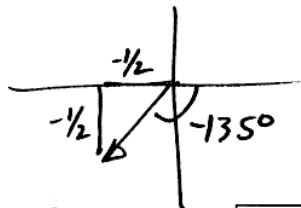
$$W^* = -3 - j\sqrt{3} = 2\sqrt{3}e^{-j5\pi/6} = 2\sqrt{3}e^{-j2.618}$$



- (b) For $U = -1 + j$, express the inverse U^{-1} in rectangular form. In addition, plot U^{-1} as a vector.

$$U^{-1} = \frac{1}{U} = \frac{U^*}{|U|^2} = \frac{-1-j}{1^2+1^2} = -\frac{1}{2} - \frac{j}{2}$$

$$= \frac{\sqrt{2}}{2}e^{-j3\pi/4} = \frac{\sqrt{2}}{2}e^{-j2.356}$$



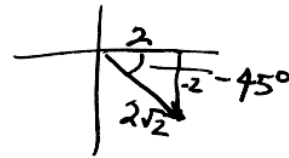
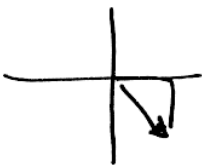
- (c) For $Z = j(1-j)^3$, express Z in polar form. In addition, plot Z as a vector.

$$1-j = \sqrt{2}e^{-j\pi/4} \quad (1-j)^3 = 2\sqrt{2}e^{-j3\pi/4}$$

$$Z = (e^{j\pi/2})(2\sqrt{2}e^{-j3\pi/4})$$

$$= 2\sqrt{2}e^{-j\pi/4} = 2\sqrt{2}e^{-j0.785}$$

$$= 2 - j2$$



- (d) For $V = 3je^{-j\pi/3}$, express $\Re\{Ve^{j7\pi t}\}$ as a sinusoid in the standard "cosine" form.

$$V = 3e^{j\pi/2}e^{-j\pi/3} = 3e^{j\pi/6}$$

$$\Re\{3e^{j\pi/6}e^{j7\pi t}\} = 3\cos(7\pi t + \pi/6)$$