

Problem 1.22 If $z = 3 - j5$, find the value of $\ln(z)$.

Solution:

$$|z| = +\sqrt{3^2 + 5^2} = 5.83, \quad \theta = \tan^{-1} \left(\frac{-5}{3} \right) = -59^\circ,$$

$$z = |z|e^{j\theta} = 5.83e^{-j59^\circ},$$

$$\ln(z) = \ln(5.83e^{-j59^\circ})$$

$$= \ln(5.83) + \ln(e^{-j59^\circ})$$

$$= 1.76 - j59^\circ = 1.76 - j\frac{59^\circ\pi}{180^\circ} = 1.76 - j1.03.$$
