

Problem 1.21 Complex numbers z_1 and z_2 are given by

$$z_1 = 5\angle -60^\circ$$

$$z_2 = 4\angle 45^\circ.$$

- (a) Determine the product $z_1 z_2$ in polar form.
- (b) Determine the product $z_1 z_2^*$ in polar form.
- (c) Determine the ratio z_1/z_2 in polar form.
- (d) Determine the ratio z_1^*/z_2^* in polar form.
- (e) Determine $\sqrt{z_1}$ in polar form.

Solution:

(a) $z_1 z_2 = 5e^{-j60^\circ} \times 4e^{j45^\circ} = 20e^{-j15^\circ}.$

(b) $z_1 z_2^* = 5e^{-j60^\circ} \times 4e^{-j45^\circ} = 20e^{-j105^\circ}.$

(c) $\frac{z_1}{z_2} = \frac{5e^{-j60^\circ}}{4e^{j45^\circ}} = 1.25e^{-j105^\circ}.$

(d) $\frac{z_1^*}{z_2^*} = \left(\frac{z_1}{z_2}\right)^* = 1.25e^{j105^\circ}.$

(e) $\sqrt{z_1} = \sqrt{5e^{-j60^\circ}} = \pm\sqrt{5}e^{-j30^\circ}.$
