

## PROBLEM:

Simplify the following complex-valued expressions. Give your answer in either rectangular or polar form, whichever is most convenient.

(a) For  $z = 1 + j$ , evaluate  $z^3$ . (Be sure to find all possible values.)

(b) For  $z = 19e^{-j0.3}$ , evaluate  $z^2/|z|$ .

(c) For  $z = 10e^{j\pi/4}$ , evaluate  $\Re\{j * z\}$ .

(d) For  $z = 2e^{j\pi/8}$ , evaluate  $z + z^*$ .

(e) Suppose that  $z_1 = -1$  and  $z_2 = re^{j\pi/4}$ , where  $0 \leq r < \infty$ . Consider the sum  $z_3 = z_1 + z_2$ . Determine the range of possible values of  $\arg\{z_3\}$  as  $r$  varies from 0 to  $\infty$ . (A sketch of  $z_1$  and  $z_2$  in the complex plane may help you see the answer.)