

Ex: Give numerical answers to each of the following questions:

- Find the value of $z = 3 + j4 + -4 + j3$.
- Find the magnitude of $z = 8 - j15$.
- Find the conjugate of $z = \frac{j4}{1-j}$.
- Find the real part of $z = je^{j\pi/4}$.
- Find the value of $z = (-4 - j3)(3 + j4)$.

SOL'N: a) Sum the real parts, and sum the imaginary parts.

$$z = 3 + j4 + -4 + j3 = 3 - 4 + j(4 + 3) = -1 + j7$$

- b) Think of the complex number as a vector. Use the Pythagorean theorem to find the magnitude (or length) of this vector.

$$|z| = \sqrt{8^2 + 15^2} = \sqrt{289} = 17$$

- c) We use an asterisk to designate a conjugate. To find the conjugate, we change each j to $-j$.

$$z^* = \left(\frac{j4}{1-j} \right)^* = \frac{-j4}{1--j} = \frac{-j4}{1+j}$$

- d) We use Euler's formula.

$$\operatorname{Re}[z = e^{j\pi/4}] = \operatorname{Re}[\cos(\pi/4) + j \sin(\pi/4)] = \cos(\pi/4) = \frac{\sqrt{2}}{2}$$

- e) We use the distributive property to multiply the numbers.

$$z = (-4 - j3)(3 + j4) = -4(3) - j^2 3(4) + -4(j4) - j3(3)$$

$$z = -12 + 12 - j16 - j9 = -j25$$