HOMEWORK #13 prob 1 solution

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

a) Find the value of $z = 6 - j5 \; + \; -3 + j3$.

b) Find the magnitude of $z = 5 + j12$.

c) Find the conjugate of $z = \dfrac{2 + j2}{-j}$.

d) Find the real part of $z = e^{j\pi/2}$.

e) Find the value of $z = (6 - j5)(-3 + j3)$.

Sol'n: a) Sum the real parts, and sum the imaginary parts.

$$z = 6 - j5 + -3 + j3 = 6 - 3 + j(5 - 3) = 3 - j2$$

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

$$|z| = \sqrt{5^2 + 12^2} = \sqrt{169} = 13$$

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

$$z^* = \left(\frac{2 + j2}{-j} \right)^* = \frac{2 + -j2}{--j} = \frac{2 - j2}{j} = -j(2 - j2) = -2 - j2$$

d) We use Euler's formula.

$$\text{Re}[z = e^{j\pi/2}] = \text{Re}[\cos(\pi/2) + j\sin(\pi/2)] = \cos(\pi/2) = 0$$

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

$$z = (6 - j5)(-3 + j3) = 6(-3) - j^2 5(3) + 6(j3) - j5(-3)$$

$$z = -18 + 15 + j18 + j15 = -3 + j33$$