

HW0.doc

1. Compute the polar form of the complex numbers $e^{j(1+j)}$ and $(1+j)e^{-j\pi/2}$.
2. Compute the rectangular form of the complex numbers $2e^{j5\pi/4}$ and $e^{-j\pi} + e^{j6\pi}$.
3. Evaluate, the easy way, the magnitude $|(2-j2)^3|$ and the angle $\angle(-1-j)^2$.
4. Using Euler's relation, $e^{j\theta} = \cos\theta + j\sin\theta$, derive the expression

$$\cos\theta = \frac{1}{2}e^{j\theta} + \frac{1}{2}e^{-j\theta}$$

5. If z_1 and z_2 are complex numbers, and a star denotes complex conjugate, express the following quantities in terms of the real and imaginary parts of z_1 and z_2 :

$$\operatorname{Re}[z_1 - z_1^*], \quad \operatorname{Im}[z_1 z_2], \quad \operatorname{Re}[z_1 / z_2]$$

6. What is the relationship among the three expressions below?

$$\int_{-\infty}^{\infty} x(\sigma) d\sigma, \quad \int_{-\infty}^{\infty} x(-\sigma) d\sigma, \quad 2 \int_{-\infty}^{\infty} x(2\sigma) d\sigma$$

7. Simplify the three expressions below.

$$\frac{d}{dt} \int_0^t x(\sigma) d\sigma, \quad \frac{d}{dt} \int_{-t}^0 x(\sigma) d\sigma, \quad \frac{d}{d\sigma} \int_t^0 x(\sigma) d\sigma$$