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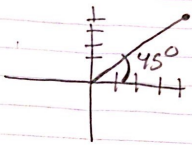
Quiz 1

1 $z = 4 + 4j$



$|z| = \sqrt{4^2 + 4^2} = \sqrt{32}$

$\phi = 45$

$z = \sqrt{32} e^{j(\pi/4)}$

2 $z_1 = 1$ $\quad \phi_1 = 0$ $\quad z_2 = j$ $\quad \phi_2 = \pi/2$

$z = e^{j(0)} = 1$ $\quad z = \sqrt{j}\, e^{j(\pi/2)}$

$z_3 = -1$ $\quad \phi_3 = \pi$ $\quad z_4 = -j$ $\quad \phi_2 = 3\pi/2$

$z = j e^{j\pi}$ $\quad z = j\sqrt{j}\, e^{j(3\pi/2)}$

3 The phase angle is shifting 90° or $\pi/2$ radians. This is causing it oscillate from real to imaginary

4 $z = 2e^{j(\pi/4)}$

$|z| = 2$

$\phi = \pi/2$

$z = \sqrt{2} + j\sqrt{2}$

5 $z = 5e^{j\pi}$

$|z| = 5$

$\phi = \pi$

$z = -5$

6 $V = a_1 e^{jx_1} + a_2 e^{jx_2}$

$V^* = a_1 e^{-jx_1} + a_2 e^{-jx_2}$

$V^*V = a_1^2 e^{0(x_1)} + a_1 a_2 e^{j(x_1 - x_2)} + a_1 a_2 e^{j(x_2 - x_1)} + a_2^2 e^{0(x_2)}$

$V^*V = a_1^2 + a_1 a_2 e^{-j(x_2 - x_1)} + a_1 a_2 e^{j(x_2 - x_1)} + a_2^2$

$\phi_2 - \phi_1 = \pi = a_1^2 + a_2^2 + a_1 a_2 e^{-\pi j} + a_1 a_2 e^{\pi j}$

$= a_1^2 + a_2^2 + 2a_1 a_2$

$\phi_2 - \phi_1 = 0 = a_1^2 + a_2^2 + a_1 a_2 e^{0j} + a_1 a_2 e^{0j}$

$= a_1^2 + a_2^2 + 2a_1 a_2$

7. In each case it would be a tan-1 (0/Re{V3} resulting in an angle of $3\pi/2$, or $\pi/2$

These results make sense because the imaginary part cancelled out and always equals zero.

8 Let $L=0$ $(Z_2=0)$

$$h(\omega) = \frac{Z_3}{Z_1 + Z_3}$$

$$h(\omega) = \frac{1}{(\omega\tau)^2} - j\left(\frac{(\omega\tau)}{1+(\omega\tau)^2}\right)$$

$$h(\omega) = 1 + (\omega\tau)^2 - j(\omega\tau)^3$$

(Real) (Imaginary)