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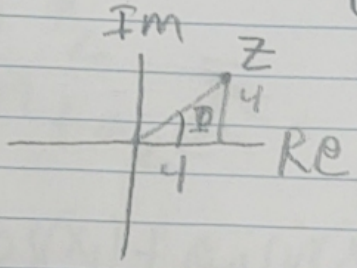
COSC 360

Quiz 1

1. $z = 4 + 4j = \sqrt{16+16} = \sqrt{32} = \boxed{4\sqrt{2}e^{j\frac{\pi}{4}}}$



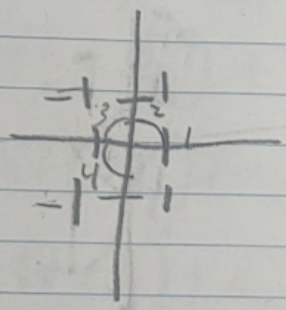
2. $z_1 = 1$, $z_2 = j$, $z_3 = -1$, $z_4 = -j$

$z_1 = e^{j\pi}$

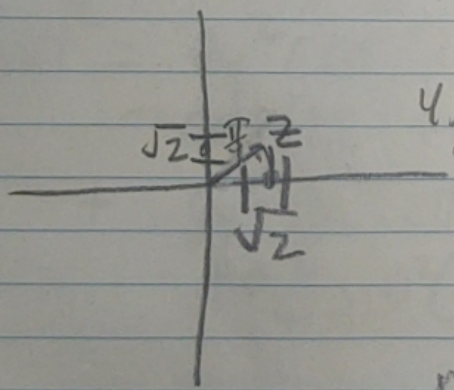
$z_2 = e^{j\frac{\pi}{2}}$

$z_3 = e^{-j\pi}$

$z_4 = e^{-j\frac{\pi}{2}}$



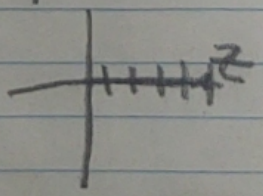
3. They add 90° to each phase number starting at 0°.

4. 

45, 45, 90

$\boxed{\sqrt{2} + \sqrt{2}j}$

5. no triangle



$\boxed{\sqrt{5}}$

6. $X_1 = 2\pi ft + \Phi_1$

$X_2 = 2\pi ft + \Phi_2$

$V(t) = a_1 e^{jX_1} + a_2 e^{jX_2}$

$V(t) = a_1\cos(X_1) + a_1 j\sin(X_1) + a_2\cos(X_2) + j a_2 \sin(X_2)$

$V(t) = (a_1\cos(2\pi ft + \Phi_1) + a_2\cos(2\pi ft + \Phi_2)) +$
$j(a_1\sin(2\pi ft + \Phi_1) + a_2\sin(2\pi ft + \Phi_2))$

$V^*(t) = (a_1\cos(2\pi ft + \Phi_1) + a_2\cos(2\pi ft + \Phi_2)) -$
$j(a_1\sin(2\pi ft + \Phi_1) + a_2\sin(2\pi ft + \Phi_2))$

$|V|^2 = (a_1\cos(2\pi ft + \Phi_1) + (a_2\cos(2\pi ft + \Phi_2))^2 +$
$((a_1\sin(2\pi ft + \Phi_1) + a_2\sin(2\pi ft + \Phi_2))^2$

$|V|^2 = a_1^2\cos^2(2\pi ft + \Phi_1) + 2a_1a_2\cos(2\pi ft + \Phi_1)$
$\cos(2\pi ft + \Phi_2) + a_2^2\cos^2(2\pi ft + \Phi_2)$
$+ a_1^2\sin^2(2\pi ft + \Phi_1) + 2a_1a_2\sin(2\pi ft + \Phi_1)\sin(2\pi ft + \Phi_2)$
$+ a_2^2\sin^2(2\pi ft + \Phi_2)$

$\Phi_2 = \Phi_1 + \pi \quad \Phi_1 = \Phi_2 - \pi$

$V(t) = (a_1\cos(2\pi ft + \Phi_2 - \pi) + a_2\cos(2\pi ft + \Phi_1 + \pi)) +$

$j(a_1\sin(2\pi ft + \Phi_2 - \pi) + a_2\sin(2\pi ft + \Phi_1 + \pi))$

$\Phi_2 = \Phi_1 = \Phi$

$V(t) = (a_1\cos(2\pi ft + \Phi) + a_2\cos(2\pi ft + \Phi)) +$

$j(a_1\sin(2\pi ft + \Phi) + a_2\sin(2\pi ft + \Phi))$

1. $\angle V = \tan^{-1}\left(\frac{a_1\sin(2\pi ft + \Phi_1) + a_2\sin(2\pi ft + \Phi_2)}{a_1\cos(2\pi ft + \Phi_1) + a_2\cos(2\pi ft + \Phi_2)}\right)$

$\angle V = \tan^{-1}\left(\frac{a_1\sin(2\pi ft + \Phi_2 - \pi) + a_2\sin(2\pi ft + \Phi_1 + \pi)}{a_1\cos(2\pi ft + \Phi_2 - \pi) + a_2\cos(2\pi ft + \Phi_1 + \pi)}\right)$

$\angle V = \tan^{-1}\left(\frac{a_1\sin(2\pi ft + \Phi) + a_2\sin(2\pi ft + \Phi)}{a_1\cos(2\pi ft + \Phi) + a_2\cos(2\pi ft + \Phi)}\right)$

8. $L=0 \quad Z_2=0$

$T=RC$

$$h(w)=\frac{Z_3}{Z_1+Z_3} \qquad h(w)=\frac{k^4}{k^4+(wT)^2}-j\frac{k^2wT}{k^4+(wT)^2}$$

$$Z_R=R+0j$$

$$Z_C=0+\frac{1}{jwC}$$

$$k^2=1-\left(\frac{w}{w_c}\right)^2$$

$$h(w)=\frac{1}{RjwC+1}$$