Quiz 1

$\sqrt{4^2+4^2}$

1. $z = 4+4j \Rightarrow r = \sqrt{32}$ $\Rightarrow \boxed{z = \sqrt{32}\, e^{(j\pi/4)}}$

$\tan(\phi) = \frac{4}{4}$ $\tan^{-1}(1) = 45^\circ$ or $\pi/4$

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

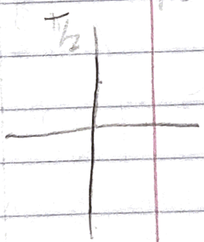
$z_1 = 1e^{0},\ z_2 = 1e^{j\pi/2},\ z_3 = 1e^{j\pi},\ z_4 = 1e^{j3\pi/2}$

3. each of the vectors are along the real or imaginary axis. z_1 is at 0°, z_2 is at 90°, z_3 is at 180°, & z_4 is at 270°. Adding one of these vectors could cause a rotation.

$z = x + jy$

$\tan\phi = \frac{y}{x} = \frac{\sqrt{2}}{\sqrt{2}}$

1. $z = 2e^{j\pi/4}$ $\tan \pi/4 = 1$ $\Rightarrow z = \sqrt{2} + j\sqrt{2}$



$r = \sqrt{x^2+y^2} \Rightarrow \sqrt{(\sqrt{2})^2 + (\sqrt{2})^2} = 2$

2. $z = 5e^{j\pi}$ $\tan\pi = 0$ so $y = 0$

$\sqrt{5^2+0^2}$ $5 = r$ $z = -5 + j0$ zero

$$V(t) = a_1 e^{jx_1} + a_2 e^{jx_2}$$

$$= a_1(\cos x_1 + j\sin x_1) + a_2(\cos x_2 + j\sin x_2)$$

$V = a_1 \cos x_1 + a_2 \cos x_2$ $\quad$ $\cancel{x_2 - x_1 = \pi}$

$V^* = a_1 j \sin x_1 + a_2 j \sin x_2$ $\quad$ $x_2 - x_1 = 0$

$x_2 = x_1$

$\cancel{|V|^2 = a_1^2 j \cos x_1 \sin x_1 + a_1 a_2 j \cos x_1 \sin x_2 + a_1 a_2 j \cos x_2 \sin x_1}$

$\cancel{+ a_2^2 j \cos x_2 \sin x_2}$

2. $\tan^{-1}\left(\dfrac{a_1 j \sin x_1 + a_2 j \sin x_2}{a_1 \cos x_1 + a_2 \cos x_2}\right) = \phi_v$

$\Rightarrow \tan^{-1}(j(a_1 \tan x_1 + a_2 \tan x_2)) \Rightarrow j(a_1 x_1 + a_2 x_2)$

$\phi_v = j a_1 x_1 + j a_2 x_2$

$\phi_2 - \phi_1 = \pi$

$\phi_2 - \phi_1 = 0$

Based on the destructive interference of the phases, having phase values on the real axis ~~makes sence~~ because cosine is 1 or −1 while sine goes to 0. Which means the imaginary values go to zero when they destructively interfere.

$$h(w) = \frac{Z_3}{Z_1 + Z_3} , \quad T = RC$$

$$Z_1 = R + 0i \qquad Z_3 = 0 + \frac{1}{jwC}$$

$$\Rightarrow \frac{\frac{1}{jwC}}{R + 0i + \frac{1}{jwC}} \Rightarrow \frac{1}{jwRC + jwCi} + 1$$

Imaginary real

$|h(w)|$ is a function of freq