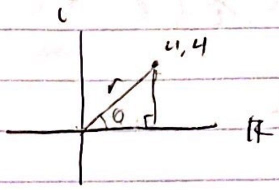
Convert to polar:

① $z = 4 + 4j$



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

$\theta = 45°$

$|z| = \sqrt{32}$

$z = \sqrt{32}\cos\left(\frac{\pi}{4}\right) + \sqrt{32}\sin\left(\frac{\pi}{4}\right)$

$\boxed{z = \sqrt{32}\left[\cos\left(\frac{\pi}{4}\right) + j\sin\left(\frac{\pi}{4}\right)\right]}$

or

$\boxed{z = \sqrt{32}e^{j\left(\frac{\pi}{4}\right)}}$

② $z = 1$ $\quad$ $z = j$

$\phi = 0$ $\quad$ $\phi = \frac{\pi}{2}$

$z = \sqrt{1}ej(0)$ $\quad$ $z = \sqrt{j}\,e\left(j\left(\frac{\pi}{2}\right)\right)$

$z = -1$ $\quad$ $z = -j$

$\phi = \pi$ $\quad$ $\phi = \frac{3\pi}{2}$

$z = \sqrt{-1}\,je\,j(\pi$ $\quad$ $z = \sqrt{-j} = z = j\sqrt{j}\,e^{j\left(\frac{3\pi}{2}\right)}$

Convert to Rectangular:

① $z = 2\exp(j\pi/4)$

$|z| \Rightarrow \sqrt{4} \Rightarrow \sqrt{2+2}$ $\quad$ $\frac{\pi}{4} = 45°$

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

② $z = 5^{j(\pi)}$

$\boxed{z = -5j}$

Scanned with CamScanner

Sinusoids:

$x_i = 2\pi f t + \phi_i$

$V(t) = a_1(j x_1) + a_2(j x_2)$

① $|V|^2 = V^* V$

$V(t) = (a_1[\cos(x_1) + j\sin(x_1)]) + (a_2[\cos(x_2) + j\sin(x_2)])$

$V(t)^* = (a_1[\cos(x_1) - j\sin(x_1)]) + (a_2[\cos(x_2) - j\sin(x_2)])$

$V^* V = (a_1^2[\cos^2(x_1) - j\sin^2(x_1)]) +$
$(a_2^2[\cos^2(x_2) - j\sin^2(x_2)])$.

$V = a_1 e(j x_1) + a_2 e(j x_2)$

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

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

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

$\boxed{= a_1^2 + a_2^2 + 2a_1 a_2}$

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

$\boxed{= a_1^2 + a_2^2 + 2a_1 a_2}$

(2) In one case the $\tan^{-1}$ will yield $\boxed{\frac{\pi}{2}}$

In the other case $\tan^{-1}$ will yield $\boxed{\frac{3\pi}{2}}$

$$\phi_V = \tan^{-1}(\text{Im}(V) / \text{Re}(V))$$

$$\phi_1 = \frac{\pi}{2} \qquad \phi_2 = \frac{3\pi}{2}$$

AC circuits:

$$h(w) = \frac{z_2 + z_3}{z_1 + z_2 + z_3}$$

$$h(w) = \frac{z_1}{z_2 + z_3}$$

$L = 0 \rightarrow w_{LC}^{-2} = 0$ $\qquad$ $\underset{\text{undefined}}{K^2} = 1 - \left(\frac{L}{d}\right)^2$

So...

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

$\mathbb{R}$ $\qquad$ Im