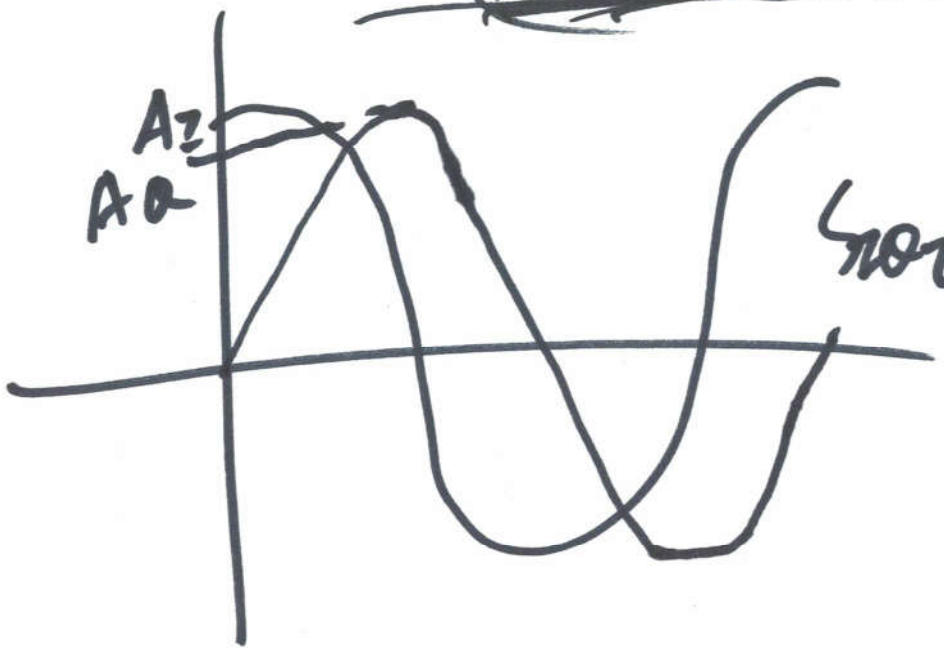
A Final Note On Phasors

Quadrature Amplitude Modulation (QAM)

$$S_{IQ}(t) = A_I \cos 2\pi f_0 t + A_Q \sin 2\pi f_0 t$$

$$= \sqrt{A_I^2 + A_Q^2}\cos\left(2\pi f_0 t + \tan^{-1}\frac{A_Q}{A_I}\right)$$

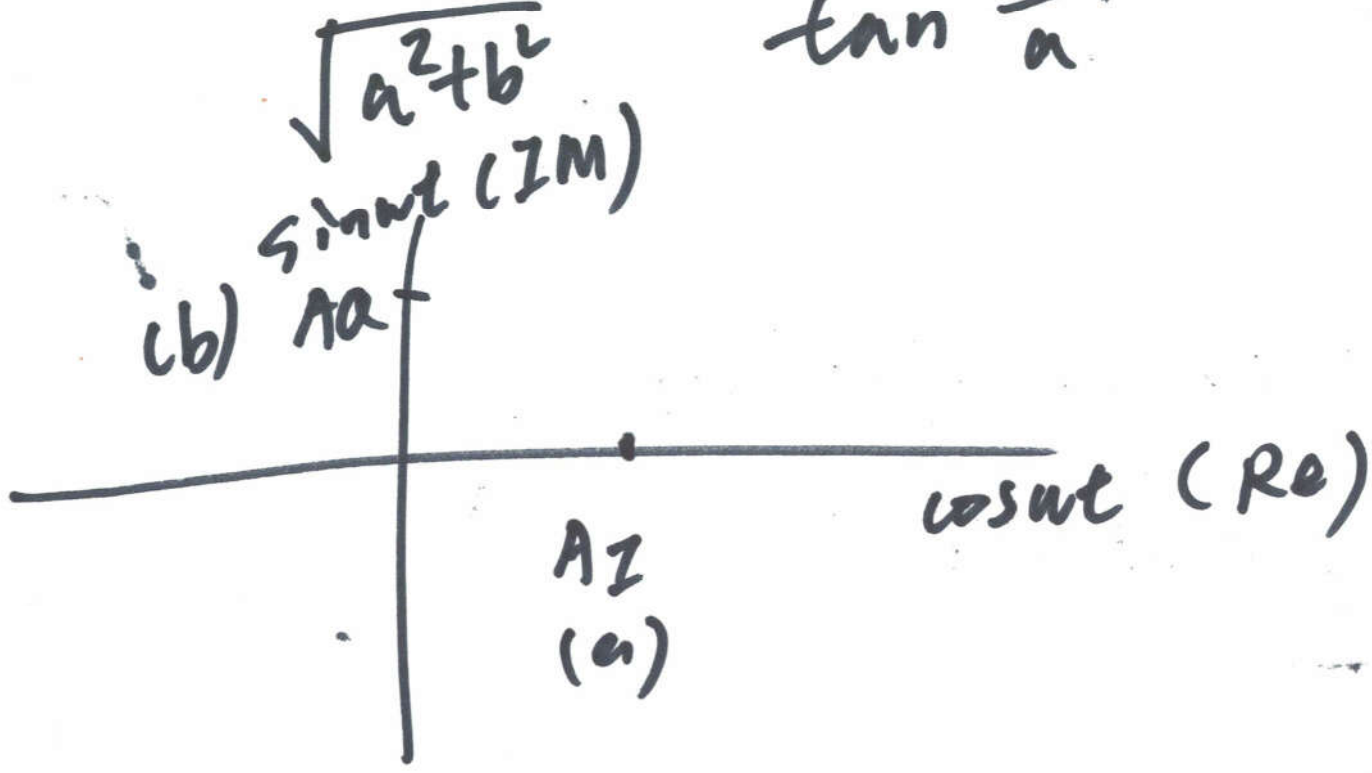


$$S_{IQ_2}(t) = A_{I_2}\cos\left(\omega_0 t + \frac{\pi}{4}\right) + A_{Q_2}\sin\left(2\pi f_0 t + \frac{\pi}{2}\right)$$

$(a+bj)$ carries all the information to recover a sine wave.

$$e^{jwt} = \cos wt + j \sin wt$$

$\sqrt{a^2+b^2}$ $\quad \tan^{-1}\frac{b}{a}$



Signal 1: $\sqrt{A^2+B^2}\, e^{j(\omega t-\frac{\pi}{2})}$

Signal 2: $\sqrt{C^2+D^2}\, e^{j(\omega t-\frac{\pi}{4})}$

Signal 1 × Signal 2:

$$\sqrt{(A^2+B^2)(C^2+D^2)}\cdot e^{j(\omega t-\frac{3}{4}\pi)}$$