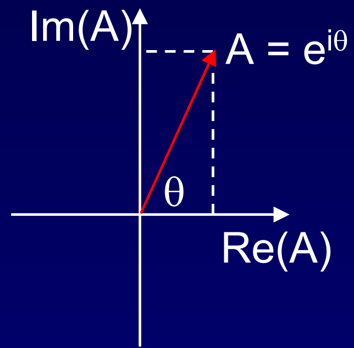
Review of Complex Numbers

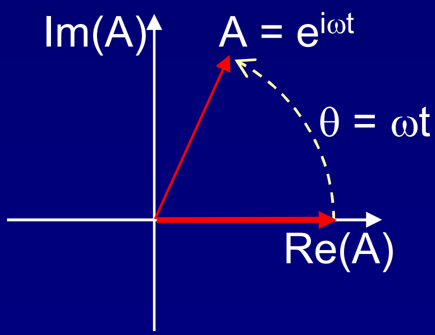
The equation, $e^{i\theta} = \cos\theta + i\sin\theta$, might be new to you. It is a convenient way to represent complex numbers. It also (once you are used to it) makes trigonometry simpler.

a. Draw an Argand diagram of $e^{i\theta}$.



The Argand diagram of a complex number, A, puts Re(A) on the x-axis and Im(A) on the y-axis. Notice the trig relation between the x and y components. θ is the angle of A from the real axis. In an Argand diagram, $e^{i\theta}$ looks like a vector of length 1, and components ($\cos\theta$, $\sin\theta$).

b. Suppose that θ varies with time, $\theta = \omega t$. How does the Argand diagram behave?



At $t = 0$, $\theta = 0$, so A = 1 (no imaginary component).
As time progresses, A rotates counterclockwise with angular frequency ω.
This is the math that underlies phasors.

The quantity, $ce^{i\theta}$ (c and θ both real), is a complex number of magnitude $|c|$. The magnitude of a complex number, A, is $|A| = \sqrt{(A^*A)}$, where A^* is the complex conjugate of A.