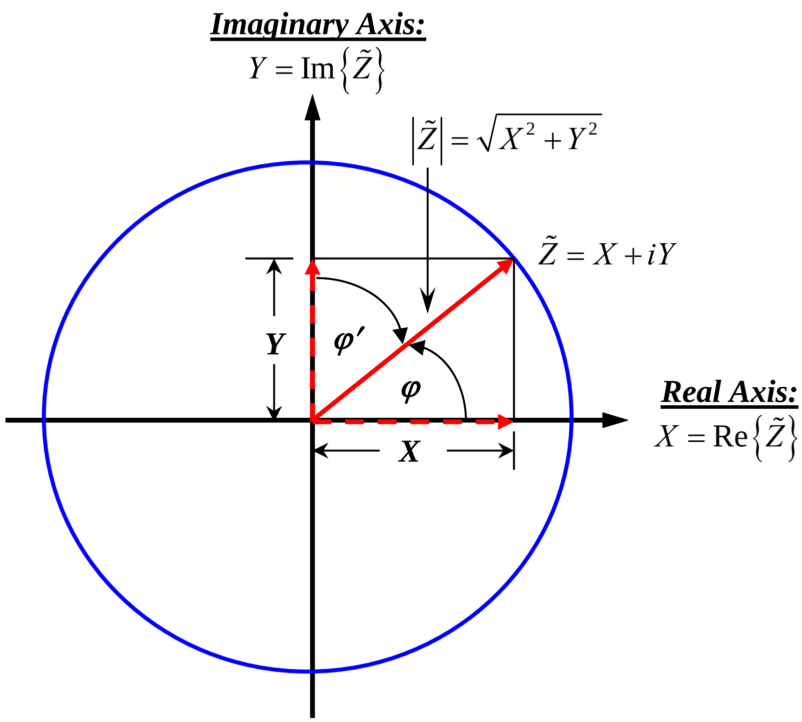
The ***in-phase***, so-called "***real***" component of $\tilde{Z}$, $X = \text{Re}\{\tilde{Z}\}$ by convention is drawn along the *x*, or horizontal axis (*i.e*. the ***abscissa***), as shown in the figure below.

The 90° ***out-of-phase/quadrature***, so-called "***imaginary***" component of $\tilde{Z}$, $Y = \text{Im}\{\tilde{Z}\}$ by convention is drawn along the *y*, or vertical axis (*i.e*. the ***ordinate***), as shown in the figure below.



It can be readily seen from the above diagram that the endpoint of the complex "vector" (*aka* "phasor"), $\tilde{Z} = X + iY$ lies at a point on the circumference of a circle, centered at (X, Y) = (0, 0), with "radius" (*i.e*. magnitude) $|\tilde{Z}| = \sqrt{X^2 + Y^2}$ and phase angle, $\varphi = \tan^{-1}(Y/X)$ (*n.b*. defined relative to the X-axis), (or equivalently: $\varphi' = \tan^{-1}(X/Y)$, *n.b*. defined relative to the Y-axis).

Instead of using Cartesian coordinates, we can alternatively/equivalently express the complex variable, $\tilde{Z}$ in polar coordinate form: $\tilde{Z} = |\tilde{Z}|(\cos\varphi + i\sin\varphi)$, since from the above diagram, we see that $X = |\tilde{Z}|\cos\varphi$ and $Y = |\tilde{Z}|\sin\varphi$. Recall the trigonometric identity: $\cos^2\varphi + \sin^2\varphi = 1$ which is used in obtaining the magnitude of $\tilde{Z}$, $|\tilde{Z}|$ from $\tilde{Z}$ itself:

$$
\begin{aligned}
|\tilde{Z}| &= \sqrt{\tilde{Z}\tilde{Z}^*} = |\tilde{Z}|\sqrt{(\cos\varphi + i\sin\varphi)(\cos\varphi - i\sin\varphi)} \\
&= |\tilde{Z}|\sqrt{\cos^2\varphi + \cancel{i\sin\varphi\cos\varphi} - \cancel{i\sin\varphi\cos\varphi} + \sin^2\varphi} \\
&= |\tilde{Z}|\sqrt{\cos^2\varphi + \sin^2\varphi} = |\tilde{Z}|
\end{aligned}
$$