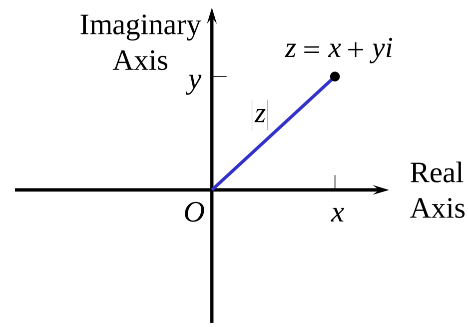
$$x^2 = -1$$

$$\boxed{i^2 = -1}$$

Complex numbers are numbers of the form ***a*** **+** ***bi***, where *a* and *b* are real numbers. The real number *a* is called the **real part** of the number *a* + *bi*; the real number *b* is called the **imaginary part** of *a* + *bi*.

Complex Plane



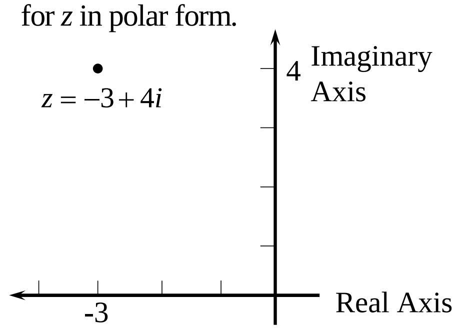
$$z = x + yi = (r\cos\theta) + (r\sin\theta)i$$

Cartesian Form — Polar Form

$$\boxed{z = r(\cos\theta + i\sin\theta)}$$

where θ, $0 \le \theta < 2\pi$, is the **argument of z**

Plot the point corresponding to $z = -3 + 4i$ in the complex plane, and write an expression for z in polar form.



Theorem

Let $z_1 = r_1(\cos\theta_1 + i\sin\theta_1)$ and $z_2 = r_2(\cos\theta_2 + i\sin\theta_2)$ be two complex numbers. Then

$$\boxed{z_1 z_2 = r_1 r_2[\cos(\theta_1 + \theta_2) + i\sin(\theta_1 + \theta_2)]}$$

If $z_2 \ne 0$, then

$$\boxed{\frac{z_1}{z_2} = \frac{r_1}{r_2}[\cos(\theta_1 - \theta_2) + i\sin(\theta_1 - \theta_2)]}$$

If $z = 4(\cos 40^\circ + i\sin 40^\circ)$ and $w = 6(\cos 120^\circ + i\sin 120^\circ)$ find

(a) zw (b) z/w

Theorem DeMoivre's Theorem

If $z = r(\cos\theta + i\sin\theta)$ is a complex number, then

$$z^n = r^n(\cos n\theta + i\sin n\theta)$$

where $n \geq 1$ is a positive integer.