Complex numbers

chapter 3

Section 3.7 Polar form of a complex number

PROJECT MATHS Text & Tests 6

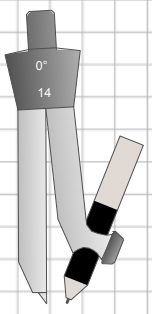
Example 2

Express $(-1 + i\sqrt{3})$ in the form $r(\cos\theta + i\sin\theta)$.

rectangular form — polar form

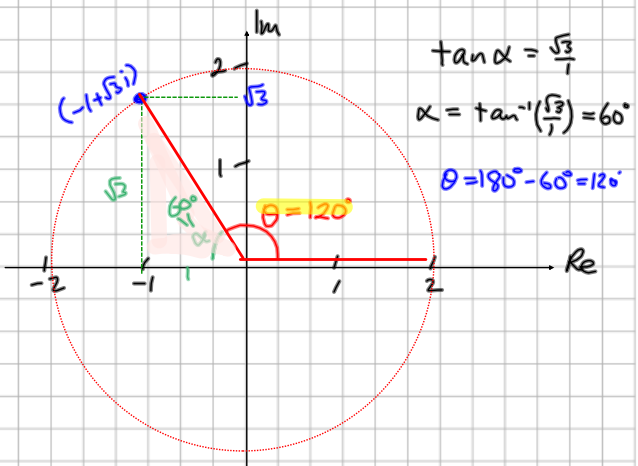
$r = ?$ (modulus)
$\theta = ?$ (argument)

$r = |a+bi| = \sqrt{a^2+b^2}$



$r = \sqrt{(-1)^2 + (\sqrt{3})^2} \Rightarrow r = 2$

$\sqrt{3} \approx 1.7$



$\tan\alpha = \frac{\sqrt{3}}{1}$

$\alpha = \tan^{-1}\left(\frac{\sqrt{3}}{1}\right) = 60°$

$\theta = 180° - 60° = 120°$

$-1 + i\sqrt{3} = 2(\cos 120° + i \sin 120°)$

3. Express each of the following complex numbers in polar form.

(i) $1 + i$ (ii) $\sqrt{3} + i$

$r = ?$ (modulus)
$\theta = ?$ (argument)

$r = \sqrt{a^2 + b^2}$

Polar form:
$r(\cos\theta + i\sin\theta)$

$r = \sqrt{1^2 + 1^2} \Rightarrow r = \sqrt{2}$ $\sqrt{2} \approx 1.4$

sketch

$\theta = 45°$

$1 + i = \sqrt{2}(\cos 45° + i \sin 45°)$