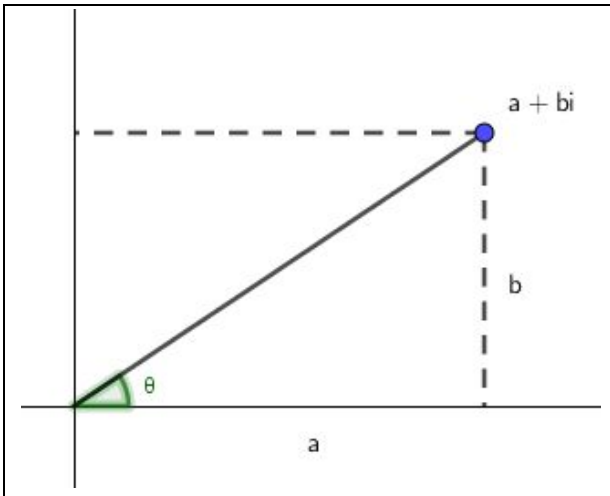
Class Discussion

Unit 6 Topic 5 Part 1 Trigonometric Form of a Complex number

Trigonometric form of a complex number



modulus: $r = |z| = \sqrt{a^2 + b^2}$

argument: $0 \le \theta < 2\pi$
when

$$\cos\theta = \frac{a}{\sqrt{a^2 + b^2}}$$

$$\sin\theta = \frac{b}{\sqrt{a^2 + b^2}}$$

$$z = a + bi = \sqrt{a^2 + b^2}\left(\frac{a}{\sqrt{a^2 + b^2}} + i\frac{b}{\sqrt{a^2 + b^2}}\right)$$

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

Ex 1:

(1) Find the zeros for the polynomial,

(2) Represent the solutions from (1) graphically on the complex plane, and

(3) write the solution from (1) in their trigonometric forms

If the polynomial is $f(x) = x^3 - 3x^2 + 3x - 2$

Ex 2: Given $z_1 = r_1(\cos\theta_1 + i\sin\theta_1)$, $z_2 = r_2(\cos\theta_2 + i\sin\theta_2)$

Prove:

(a) $z_1 z_2 = r_1 r_2\left(\cos(\theta_1 + \theta_2) + i\sin(\theta_1 + \theta_2)\right)$

(b) $\frac{z_1}{z_2} = \frac{r_1}{r_2}\left(\cos(\theta_1 - \theta_2) + i\sin(\theta_1 - \theta_2)\right)$

Ex 3: Evaluate $\left(-\sqrt{2}+i\sqrt{2}\right)^4$