Tuesday, February 10, 2015

Trigonometric Form of Complex Numbers

1. Standard Form of a complex number is a + bi.

2. The Absolute Value is computed as $\sqrt{a^2 + b^2}$

3. Given a complx number in standard form: 3 + 4i

4. The absolute value, r, of 3 + 4i is: $\sqrt{3^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25} = 5$

5. The Argand Plane is used to plot complex numbers: 3 + 4i → (3, 4)

6. Trigonometric Form of a complex number: $r(\cos\theta + i \sin\theta) = r \text{ cis } \theta$

7. $\theta = \tan^{-1}\left(\frac{4}{3}\right) \approx 53.130^\circ \approx 0.927$ Radians

8. The Trigonometric Form of 3 + 4i: → 5 cis 53.130° or 5 cis 0.927

9. This is very much like converting vectors from rectangular form to polar form

10. Convert 12 cis 27° to Standard Form:
$12(\cos 27^\circ + i \sin 27^\circ) = 12(0.891 + 0.454\,i) = \boxed{10.692 + 5.448i}$

11. Convert -34 + 53i to Trigonometric Form:
$r = \sqrt{34^2 + 53^2} = 62.968 \quad \theta = \arctan\frac{53}{-34} = -57.319^\circ$ Add 180° → 122.681° $\boxed{62.968 \text{ cis } 122.681^\circ}$

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Convert to Trigonometric Form, using Degrees from 0° to 359.999°

1. $5 - 5i$

2. $-7 + 4i$

3. $2\sqrt{2} - i$

4. $-8 - 5\sqrt{3}\, i$

5. $-2(1 + \sqrt{3}\, i)$

Convert to Standard Form.

6. $2 \text{ cis } 120°$

7. $\frac{3}{4} \text{ cis } 315°$

8. $5 \text{ cis } \frac{\pi}{9}$

9. $6 \text{ cis } \frac{\pi}{3}$

10. $4 \text{ cis } 216.5°$