35, 79, 47, 55

$\frac{5+0i}{2+2i}$

$V_1 = 5 \text{ cis } 0°$ $r_1 = \sqrt{5^2+0^2} = 5$

$\theta_1 = \tan^{-1}\left(\frac{0}{5}\right) = 0°$

$V_2 = 2\sqrt{2} \text{ cis } 45°$ $r_2 = \sqrt{2^2+2^2} = 2\sqrt{2}$

$\theta_2 = \tan^{-1}\left(\frac{2}{2}\right) = 45°$

$\frac{5}{2\sqrt{2}} \text{ cis } (0-45)$

$\frac{5}{2\sqrt{2}}(\cos(-45°) + i\sin(-45°))$

$\frac{5}{2\cancel{\sqrt{2}}}\left(\frac{\cancel{\sqrt{2}}}{2} - \frac{\cancel{\sqrt{2}}}{2} i\right)$

$\frac{5}{4} - \frac{5}{4} i$

Nov 10-10:31 AM

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

$z^2 = r^2(\cos(2\theta) + i\sin(2\theta))$

$z^3 = r^3(\cos(3\theta) + i\sin(3\theta))$

Poll

$z^6 = r^6 \text{ cis}(6\theta)$

$z^n = r^n \text{ cis}(n\theta)$

Dec 5-3:50 PM

Steps for using Mr. Abraham's DeMoivre's Theorem:

$z^n = r^n(\text{cis}(n\theta))$

Example 6 p. 452

Use DeMoivre's Theorem to find $(-1+\sqrt{3}i)^{12}$

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

$\theta = \tan^{-1}\left(\frac{\sqrt{3}}{-1}\right) + 180°$

$\theta = 120°$

$z^{12} = 2^{12}(\text{cis } 12(120°))$

$z^{12} = 4096(\text{cis } 1440°)$

p. 458, #91 (HW)

Dec 5-4:00 PM

Roots of Complex Numbers

Fundamental Theorem of Algebra:

# of solutions is equal to the degree.

$\sqrt[4]{x^4} = \sqrt[4]{1}$

$x = \pm 1$

Double Roots

Dec 5-4:05 PM

Can we find a formula that gives us ALL the roots?

nth Roots of a Complex Number

The nth roots of a complex number z=r(cosθ+isinθ) are given by:

$$\sqrt[n]{z} = \sqrt[n]{r}\left(\text{cis } \frac{\theta+360K}{n}\right)$$

where k=0, 1, 2,..., n-1

Dec 5-4:18 PM

Example p. 458, #126

(a) Find the square roots of the given complex number, (b) represent each of the roots graphically, and (c) write each of the roots in standard form.

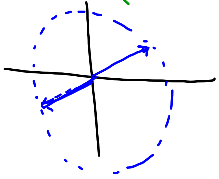
$$16(\cos 60^o + i\sin 60^o)$$

$$\sqrt{z} = \sqrt{16}\left(\text{cis } \frac{60+360K}{2}\right)$$

$K=0 = 4(\text{cis } 30^\circ)$ $\quad 4(\cos 30^\circ + i\sin 30^\circ)$ $\quad 4\left(\frac{\sqrt{3}}{2} + \frac{1}{2}i\right)$ $\quad 2\sqrt{3}+2i$

$K=1 = 4(\text{cis } 210^\circ)$ $\quad 4(\cos 210^\circ + i\sin 210^\circ)$ $\quad 4\left(-\frac{\sqrt{3}}{2} + -\frac{1}{2}i\right)$ $\quad -2\sqrt{3}-2i$

K	roots
0	$4(\text{cis}30^\circ)$
	$4(\text{cis } 210^\circ)$



p. 458, #125 (HW)

Dec 5-4:28 PM

Example 8 p. 455

Find the three cube roots of $z=-2+2i$

$r = \sqrt{(-2)^2+(2)^2} = 2\sqrt{2} = \sqrt{8}$

$$\sqrt[3]{z} = \sqrt[3]{\sqrt{8}}\left(\text{cis } \frac{135+360K}{3}\right)$$

$\theta = \tan^{-1}\left(\frac{2}{-2}\right)+180 = 135^\circ$

$\sqrt{2}\cdot\sqrt{2}\cdot\sqrt{2}$

K	Root
0	$\sqrt{2}(\text{cis } 45^\circ)$
1	$\sqrt{2}(\text{cis } 165^\circ)$
2	$\sqrt{2}(\text{cis } 285^\circ)$

p. 458, #129 (HW)

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HOMEWORK

...due Monday along with 6.5a and 6.4-6.5 Partner Quiz

6.5b (p. 458): 91-105 (odd), 113, 115, 125-131 (odd), 141, 143

Dec 4-3:18 PM