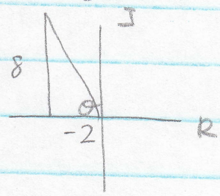
Chapter 11 Review C

1. $-2+8i$

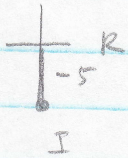


$r = \sqrt{4+64} = 2\sqrt{17}$

$\theta = 180^\circ - \tan^{-1}\left(\frac{8}{2}\right) = 180^\circ - 76.0^\circ = 104.0^\circ$

$-2+8i = 2\sqrt{17}\ \text{cis}\ 104.0^\circ$

2.

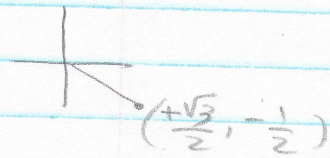


$r = 5 \quad ; \theta = \frac{3\pi}{2}$

$0 - 5i = 5\ \text{cis}\ \frac{3\pi}{2}$

3. $18\ \text{cis}\ 330^\circ = 18(\cos 330^\circ + i \sin 330^\circ)$

$= 18\left(\frac{\sqrt{3}}{2}\right) + i(18)\left(-\frac{1}{2}\right)$

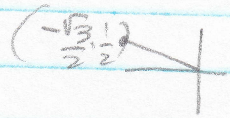


$18\ \text{cis}\ 330^\circ = 9\sqrt{3} - 9i$

4. $18\ \text{cis}\ 201^\circ = 18(\cos 201^\circ + i \sin 201^\circ)$

$-16.8 - 6.5i$ (use calc)

5. $(9\ \text{cis}\ 60^\circ)(8\ \text{cis}\ 90^\circ) =$

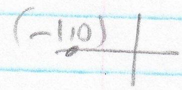


$72\ \text{cis}\ (60^\circ + 90^\circ) = 72\ \text{cis}\ 150^\circ$

$72(\cos 150^\circ + i \sin 150^\circ) = 72\left(-\frac{\sqrt{3}}{2}\right) + i(72)\left(\frac{1}{2}\right)$

$= -36\sqrt{3} + 36i$

$(9\ \text{cis}\ 60^\circ)^3 = 9^3\ \text{cis}\ 3(60^\circ) = 729 \cos 180^\circ$

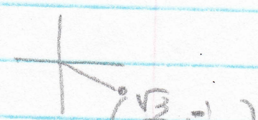


$= 729(\cos 180^\circ + i \sin 180^\circ)$

$= 729(-1) + i(729)(0) = -729 + 0i$

$\frac{9\ \text{cis}\ 60^\circ}{8\ \text{cis}\ 90^\circ} = \frac{9}{8}\ \text{cis}\ (60^\circ - 90^\circ) = \frac{9}{8}\ \text{cis}\ (-30^\circ) = \frac{9}{8}\ \text{cis}\ (-30^\circ + 360^\circ)$

$= \frac{9}{8}\ \text{cis}\ 330^\circ$



$= \frac{9}{8}(\cos 330^\circ + i \sin 330^\circ) = \frac{9}{8}\left(\frac{\sqrt{3}}{2}\right) + i\left(\frac{9}{8}\right)\left(-\frac{1}{2}\right)$

$= \frac{9\sqrt{3}}{16} - \frac{9}{16}i$

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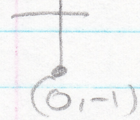
6. $\left(2 \text{ cis } \frac{5\pi}{6}\right)^{-3} = 2^{-3} \text{ cis}\left[\frac{-3}{1}\left(\frac{5\pi}{6}\right)\right]$

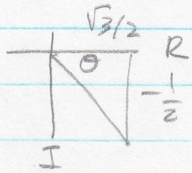
$= \frac{1}{8} \text{ cis}\left(-\frac{5\pi}{2}\right) = \frac{1}{8} \text{ cis}\left(-\frac{5\pi}{2} + 2 \cdot 2\pi\right) = \frac{1}{8} \text{ cis}\left(-\frac{5\pi}{2} + \frac{8\pi}{2}\right)$

$= \frac{1}{8} \text{ cis } \frac{3\pi}{2} = \frac{1}{8}\left(\cos \frac{3\pi}{2} + i \sin \frac{3\pi}{2}\right)$



$= \frac{1}{8}(0) + i\left(\frac{1}{8}\right)(-1) = 0 - \frac{1}{8} i$

7. $\left(\frac{\sqrt{3}}{2} - \frac{1}{2} i\right)^{10}$



$r = \sqrt{\frac{3}{4} + \frac{1}{4}} = 1$

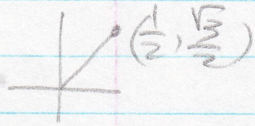
$\theta = 360° - \tan^{-1}\left(\frac{1}{2} \cdot \frac{2}{\sqrt{3}}\right) = 360° - \tan^{-1}\left(\frac{1}{\sqrt{3}}\right) = 360° - 30° = 330°$

$(1 \text{ cis } 330°)^{10} = 1^{10} \text{ cis } 10 \cdot 330° = 1 \text{ cis } 3300°$

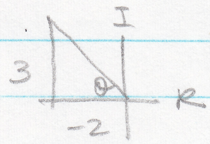
$= 1 \text{ cis}(3300° - 9 \cdot 360°) = 1 \text{ cis } 60°$

$= \cos 60° + i \sin 60°$

$= \frac{1}{2} + \frac{\sqrt{3}}{2} i$



8.



$r = \sqrt{4+9} = \sqrt{13}$

$\theta = 180° - \tan^{-1}\left(\frac{3}{2}\right)$

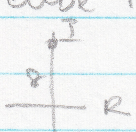
$\theta = 123.6900675\ldots$ (keep in calc)

$(\sqrt{13} \text{ cis } 123.6900675\ldots)^6 = 2197 \text{ cis } 742.1404052\ldots$ (keep in calc)

$= 2197(\cos 742.1404052\ldots + i \sin 742.1404052\ldots)$

$2035 + 828i$

9. cube root 8i



$r = 8 \quad ; \theta = 90° + n \cdot 360°$

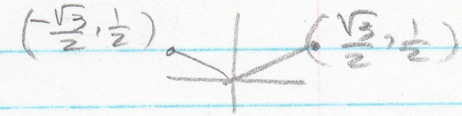
$8i = 8 \text{ cis}(90° + n \cdot 360°)$

cube root of $8i = (8 \text{ cis}(90° + n \cdot 360°))^{\frac{1}{3}}$

$= 8^{\frac{1}{3}} \text{ cis } \frac{1}{3}(90° + n \cdot 360°)$

$= 2 \text{ cis } 30° + n \cdot 120°$

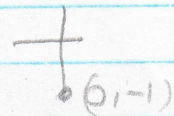
$n=0 \quad 2 \text{ cis } 30° = 2(\cos 30° + i \sin 30°)$



$2(\frac{\sqrt{3}}{2}) + i(2)(\frac{1}{2}) = \sqrt{3} + i$

$n=1 \quad 2 \text{ cis } 30° + 120° = 2 \text{ cis } 150°$

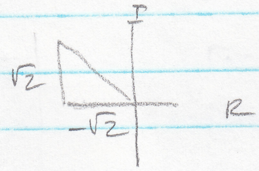
$2(-\frac{\sqrt{3}}{2}) + i(2)(\frac{1}{2}) = -\sqrt{3} + i$



$n=2 \quad 2 \text{ cis } 30° + 240° = 2 \text{ cis } 270°$

$2(0) + i(2)(-1) = 0 - 2i$

10 $\quad -\sqrt{2} + i\sqrt{2}$



$r = \sqrt{2+2} = 2$

$\theta = 180° - \tan^{-1}\left(\frac{\sqrt{2}}{\sqrt{2}}\right) =$

$135° + n \cdot 360°$

$-\sqrt{2} + i\sqrt{2} = 2 \text{ cis}(135° + n \cdot 360°)$

square roots of $(-\sqrt{2} + i\sqrt{2}) = [2 \text{ cis}(135° + n 360°)]^{\frac{1}{2}}$

$= 2^{\frac{1}{2}} \text{ cis } \frac{1}{2}(135° + n \cdot 360°)$

$= \sqrt{2} \text{ cis } 67.5° + n \cdot 180°$

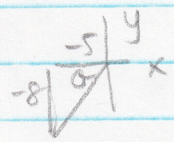
$n=0 \rightarrow \sqrt{2} \text{ cis } 67.5° = \sqrt{2}(\cos 67.5° + i \sin 67.5°)$

$= 0.54 + 1.31 i$

$n=1 \rightarrow \sqrt{2} \text{ cis }(67.5° + 180°) = \sqrt{2} \text{ cis } 247.5° = \sqrt{2}(\cos 247.5° + i \sin 247.5°)$

$= -.54 - 1.31 i$

11 $\quad (-5, -8)$



$r = \sqrt{25+64} = \sqrt{89}$

$\theta = 180° + \tan^{-1}(\frac{8}{5}) = 238.0°$

$(-5, -8) = (\sqrt{89}, 238.0°)$

no i $\qquad$ no cis

12 $\quad (18, \frac{2\pi}{3}) = 18$ c

$x = 18 \cos \frac{2\pi}{3} = 18(-\frac{1}{2}) = -9$

$y = 18 \sin \frac{2\pi}{3} = 18(\frac{\sqrt{3}}{2}) = 9\sqrt{3}$

$(18, \frac{2\pi}{3}) = (-9, 9\sqrt{3})$

no cis $\qquad$ no i

11C/4

13 $r = 1 + 4\sin\theta$

θ	$\sin\theta$	$1+4\sin\theta$
0	0	1
30°	0.5	3
90°	1	5
150°	0.5	3
180°	0	1
210°	-0.5	-1
270°	-1	-3
330°	-0.5	-1
360°	0	1