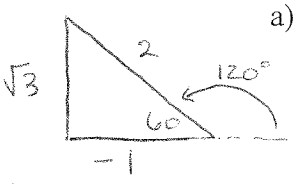
Precalculus Honors
Section 6.6

Name KEY
Period _____

Complex Numbers / De Moivre's Theorem

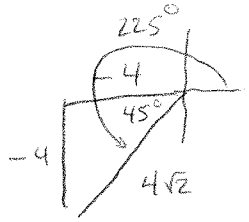
3. Write the following complex numbers in trigonometric form (use degrees):

a) $-1+i\sqrt{3}$



$2 \text{ cis } 120^\circ$

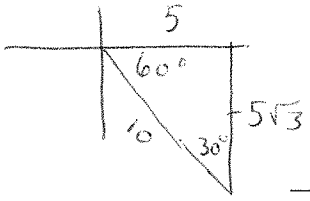
b) $-4-4i$



$4\sqrt{2} \text{ cis } 225^\circ$

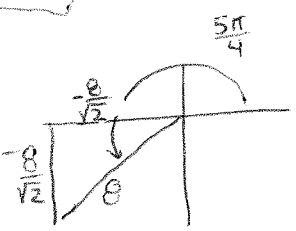
4. Write in standard $a+bi$ form:

a) $10(\cos 300^\circ + i \sin 300^\circ)$



$5 - 5i\sqrt{3}$

b) $8\left(\cos\left(\frac{5\pi}{4}\right) + i\sin\left(\frac{5\pi}{4}\right)\right)$



$-\frac{8}{\sqrt{2}} = -2\sqrt{2}$

$-4\sqrt{2} - 4i\sqrt{2}$

5. Given: $\begin{cases} z = 6(\cos 200^\circ + i \sin 200^\circ) \\ w = 4(\cos 170^\circ + i \sin 170^\circ) \end{cases}$

Find: (leave answers in trigonometric form)

a) $z \cdot w$

$6 \cdot 4 \text{ cis } (200 + 170)$

(acceptable) →

$24 \text{ cis } 370^\circ = 24 \text{ cis } 10^\circ$

b) $\frac{z}{w}$ $\quad \frac{6}{4} \text{ cis } (200^\circ - 170^\circ)$

$\frac{3}{2} \text{ cis } 30^\circ$

c) $z^3 = 6^3 \text{ cis } 3(200)$

$= 216 \text{ cis } 600$

$216 \text{ cis } 240^\circ$

d) $z^{\frac{1}{2}}$ $\quad 6^{\frac{1}{2}} \text{ cis } \frac{1}{2}(200)$

$= \sqrt{6} \text{ cis } 100^\circ$

Spacing $= \frac{2\pi}{5}$

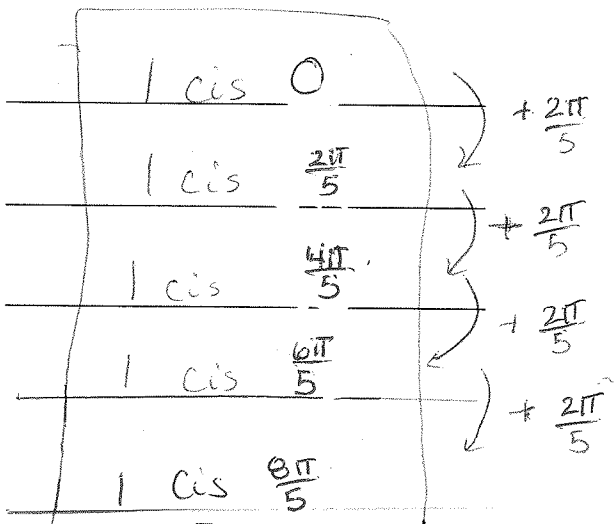
6. Find the five fifth roots of unity. Leave answers in trigonometric form (use radians).

"Unity" means the number 1.

So we want all solutions to $z^5 = 1 \quad (= 1 \text{ cis } 0)$

1st solution: either just know that one of the 5th roots is 1, or take

$$(1 \text{ cis } 0)^{1/5} = 1^{1/5} \text{ cis } \tfrac{1}{5}(0)$$
$$= 1 \text{ cis } 0.$$

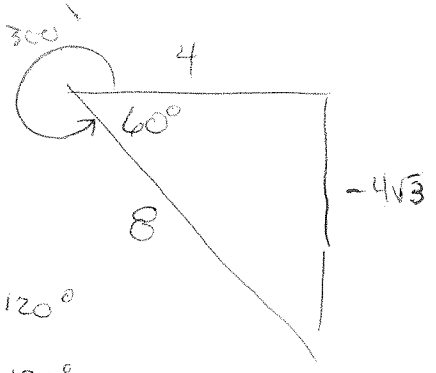


7. Find all unique solutions (in trig form) to the equation $z^3 = 4 - 4i\sqrt{3}$ (use degrees).

$$z^3 = 8 \text{ cis } 300^\circ$$

$$(8 \text{ cis } 300)^{1/3} = 8^{1/3} \text{ cis } \tfrac{1}{3}(300^\circ)$$

$$= \boxed{\begin{array}{l} 2 \text{ cis } 100^\circ \\ 2 \text{ cis } 220^\circ \\ 2 \text{ cis } 340^\circ \end{array}} \quad +120^\circ, \ +120^\circ$$



Spacing $= \frac{360^\circ}{3}$

$= 120^\circ$