Name: _____

Demoivre's Theorem and nth Roots

Exercise 1: Find the square root of each complex number:

1) $-1-i$

2) $1+i$

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

4) $\sqrt{2}+\frac{1}{2}i$

5) $\sqrt{2}+i$

6) $\sqrt{2}+3i$

7) $1+3i$

8) $\frac{1}{2}\left(cis\frac{5\pi}{6}\right)$

9) $\sqrt{2}\left(cis\frac{\pi}{6}\right)$

10) $\sqrt{5}\left(cis\frac{\pi}{3}\right)$

11) $\sqrt{2}\left(cis\pi\right)$

12) $36\left(cis\frac{\pi}{2}\right)$

Exercise 2: Find the indicated roots of the complex number and write each of the obtained roots in standard form

1) Cube roots of: $5cis60^\circ$

2) Cube roots of: $2cis30^\circ$

3) Cube roots of: $27cis270^\circ$

4) Cube roots of: $3+i$

5) Fourth roots of: $128(i-4)$

6) Fourth roots of: $-4\sqrt{2}(1-i)$

7) Fourth roots of: $32cis\frac{2\pi}{3}$

8) Fourth roots of: $12cis\frac{\pi}{4}$

9) Fifth roots of: $-21i$

10) Fifth root of: $3\sqrt{2}i-3\sqrt{2}$

11) Sixth roots of: $8cis\frac{\pi}{6}$

12) Sixth roots of: $12i$

13) Sixth roots of: 1

14) Sixth roots of: $64cis3\pi$

Exercise 3: Find all the solutions of the equation and represent the solutions graphically

1) $x^4 + i = 0$
2) $x^3 - i = 0$
3) $x^6 + 1 = 0$
4) $x^3 + 1 = 0$
5) $x^5 + 243 = 0$
6) $x^6 + 64i = 0$
7) $x^3 = 1 - i$
8) $x^5 = 1 + i$
9) $x^4 = 1 + i$
10) $x^6 = -1 - i$

Exercise 4: Show that $-\frac{1}{2}\left(1+\sqrt{3}i\right)$ is a sixth root of 1

Exercise 5: Show that $2^{-1/4}\left(1-i\right)$ is a fourth root of -2