Oxford-Moscow Quantum Club

Assignment 0

COMPLEX NUMBERS.

- If you are not familiar with complex number basis, study them, using e.g. the following Khan Academy units:

    - Algebra 2: Complex numbers;
    - Precalculus: Complex numbers
    - Precalculus (Eureka Math/EngageNY) Complex numbers and transformations (Topic B, Lessons 13-19)

    and solve the quizzes therein.

Problem 1. Problem 1 from Oxford Mathematical Methods homework.

Problem 2. Problem 2 from Oxford Mathematical Methods homework.

Problem 3. Problem 3 from Oxford Mathematical Methods homework.

Problem 4. Problem 4 from Oxford Mathematical Methods homework except(viii).

- Read more about complex exponentials e.g. in MIT Open Courseware and William Stein's notes.

Problem 5. Use complex exponentials to show that

a) $\sin(x + y) = \sin x \cos y + \cos x \sin y$;

b) $\cos(x + y) = \cos x \cos y - \sin x \sin y$

Problem 6. Problem 5 from Oxford Mathematical Methods homework (de Moivre's theorem is simply that $(\cos x + i \sin x)^n = \cos nx + i \sin nx$).

Problem 7. Problem 6 from Oxford Mathematical Methods homework.

Problem 8. Problem 7 from Oxford Mathematical Methods homework.