Assignment 2

ELECTIVE: Quantum Computing

IMPORTANT NOTE:

1. This is a programming assignment. You need to submit the code and a video where you will demonstrate execution of all the parts of the assignment.
2. If it is found that the code has been copied or any other form of cheating is done, straight zero may be given in the internal assessment component and may not be allowed to do any further components of continuous evaluation.
3. Complex numbers Algebra
4. By defining a tuple of real numbers, define the complex number as an ordered pair
5. Using this ordered pair, define the subroutines to add, subtract, multiply and divide two complex numbers (i.e. the complex number represented in cartesian coordinates as ordered pair)
6. Using the same ordered pair definition, this time however representing polar coordinates, define the routines for addition, subtraction, multiplication and division.
7. Define the subroutine to find the power and root of a complex number represented in polar coordinates.
8. Using the definition defined in part (d) above, find the 5th root and 9th power of a complex number in any representation.

NOTE: You can define any other subroutines which you may need to accomplish these tasks.

1. Verify that multiplication by (−1*,* 0) changes the sign of the real and imaginary components of a complex number.
2. Represent the complex numbers graphically: write a subroutine which accepts a complex number plots it on an argand plane.
3. Draw all the fifth roots of unity
4. Complex Vector spaces
5. Write the subroutines that perform the addition, inverse and scalar multiplication for vector space.
6. Convert subroutine written in part (a) above to do the same for vector space.
7. Write a function that accepts a vector and matrix and outputs the vector resulting from the given “action”.
8. Write a subroutine that accepts two complex vectors and calculates their inner product.
9. Hermitian and Unitary Matrices
10. Write a subroutine that accepts a square matrix and tells if its Hermitian.
11. Write a subroutine that accepts a square matrix and tells if its unitary.
12. Write a subroutine that accepts two matrices and calculates its tensor product.