Homework 1

# Question 1

For , take in .

For , take in .

# Question 2

# Question 3

Suppose and are unitary

Then

# Question 4

We then have

Since is unitary, we have

Consider

The equation above, , tells us that is also unitary.

Applying this construction to . We have

Now,

# Question 5

Using the definition of for inner product and for norm.

With the help from computer, we showed that pairwise inner product is always 0 and the norms are always 1.



We have basis here for 4 dimensional space since we found 4 vectors that are orthonormal.