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Problem 1

```
%%%% 1-(a)

% Define inv3 and inv6 for convenience
inv3 = 1 / sqrt(3);
inv6 = 1 / sqrt(6);

% Define A with pre-defined inv3 and inv6
A = [0, inv3 + inv3*i, inv6 - inv6*i;
     inv6 + inv3*i, -inv6*i, inv3;
     inv3 - inv6*i, inv6, inv3*i];

% calculate the inverse of A
inv(A)

%%%% 1-(b)

% Calculate the multiplication of A and the hermitian of A which is equal
% to A' in matlab.

A*A'
```

(a) For code, please refer to 1-(a) in the above code. The result A^{-1} is

```
ans =

   0.0000 + 0.0000i   0.4082 - 0.5774i   0.5774 + 0.4082i
   0.5774 - 0.5774i  -0.0000 + 0.4082i   0.4082 + 0.0000i
   0.4082 + 0.4082i   0.5774 - 0.0000i   0.0000 - 0.5774i
```

(b) For code, please refer to 1-(b) in the above code. The result AA^* is

```
ans =

    1.0000         0         0
         0    1.0000         0
         0         0    1.0000

fx >>
```

Hence, we can say $AA^* = I_3$, so that the matrix A is unitary.