Name: Jinghang Li
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ECE 1390 HW3
1.a.
- The matrix M you recovered from the normalized points (3x4) [text response]

```
newM =

    0.4583   -0.2947   -0.0140    0.0040
   -0.0509   -0.0546   -0.5411   -0.0524
    0.1090    0.1783   -0.0443    0.5968
```

The < u, v > projection of the first and last points given your M matrix [text response]

```
pts2d1 =

    1.0468   -0.3626


pts2d2 =

    0.1419   -0.4518
```

- The residual between that projected locations and the actual ones given [text response]

```
residual1 =

    0.0026


residual2 =

    0.0016
```

1.b.

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Average residual for each trial of each k (10x3) [text response]

```
residualResult_1b =

    2.2028    1.4329    2.3638
    3.4652    0.9826    4.3496
    2.2872    1.0991    0.4961
    1.7702    1.1766    1.8274
    3.0659    2.3666    0.6807
   17.9720    1.6925    0.6591
    1.2680    2.8687    1.3168
   11.9721    2.6559    1.0684
    1.5315    2.1489    1.1685
    1.7672    1.3315    1.0946
```

Explain any difference you see between the results for the different k's [text response]

From the residual results we could tell that the more points we use to estimate the projection matrix the more accurate overall result we will have. The first column is from using 8 points, 2nd column is from using 12 points and the third from using 16 points.

The best M matrix (3x4) [text response]

```
bestM =

   -0.0069    0.0040    0.0013    0.8267
   -0.0015   -0.0010    0.0073    0.5626
   -0.0000   -0.0000    0.0000    0.0034
```

This is the best projection matrix (obtained from using 16 points) that results in the lowest residual (0.4961)

1.c.

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The location of the camera in real 3D world coordinates [text response]

```
C =

  303.0998
  307.1840
   30.4221
```

2.a.
The matrix F generated from your least squares function [text response]

```
newfM =

   -0.0000    0.0000   -0.0009
    0.0000    0.0000   -0.0264
   -0.0019    0.0172    0.9995
```

2.b.

```
reducedfM =

   -0.0000    0.0000   -0.0009
    0.0000    0.0000   -0.0264
   -0.0019    0.0172    0.9995
```

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2.c. ps3-2-c-1

ps3-2-c-2