Homework 4

Q 1.1

Given two views, we can use fundamental matrix to capture the relationship between the corresponding points. The equation is as follows:

Where F is the fundamental matrix with 9 elements, and the is 1 when the origin is the intersection of the light ray through the image planar.

The origin of image plane is [0 0 1]’, so the result is:

Then

Q 1.2

, we can eliminate the rotation matrix R since there is only pure translation along the x axis, then the tx=1, so we can get T as:

Using this fundamental matrix F, we can get epipolar line as:

All the x and x’ locate in one line, since y and y’ are equal. Therefore, the epipole line both parallel to the x axis.

Q 1.3

Q 1.4



According to the figure, the camera C and C’ has a pure translation without rotation, also they have the same intrinsic matrix. Thus, their fundamental matrix can be related to a skew-symmetric matrix.

We can imagine there is a virtual camera right side of the mirror, so we can use projective matrix to build up relationship:

and:

Using above equations, we can build up a constraint:

Because cannot be zero, . Thus this fundamental matrix F is the skew-symmetric matrix.

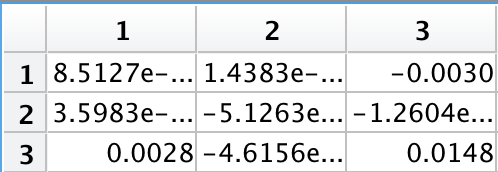
Q 2.1

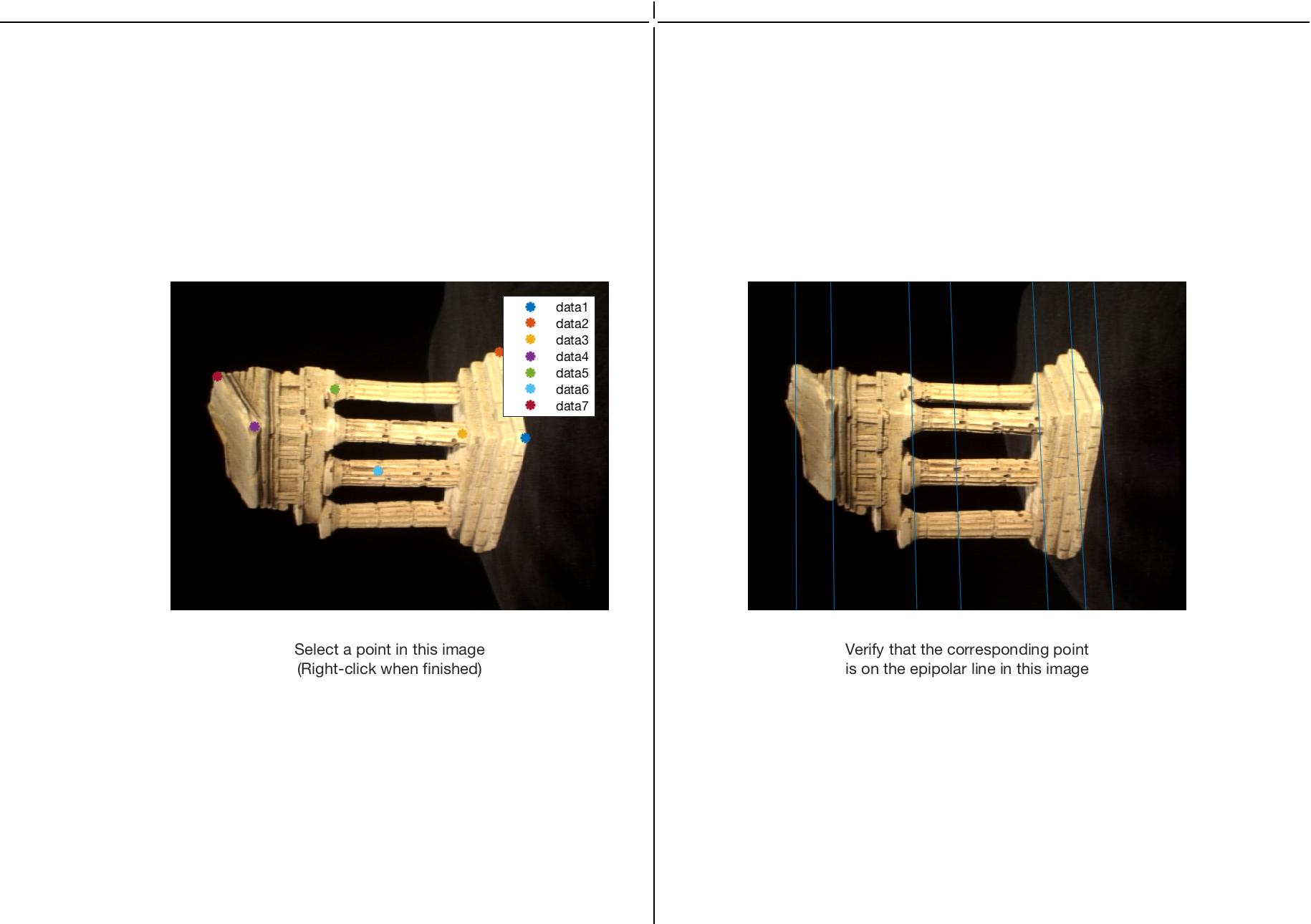
F =

0.0000 0.0000 -0.0030

0.0000 -0.0000 -0.0000

0.0028 -0.0000 0.0148





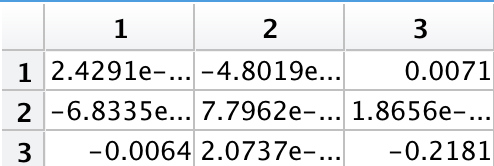
Q 2.2

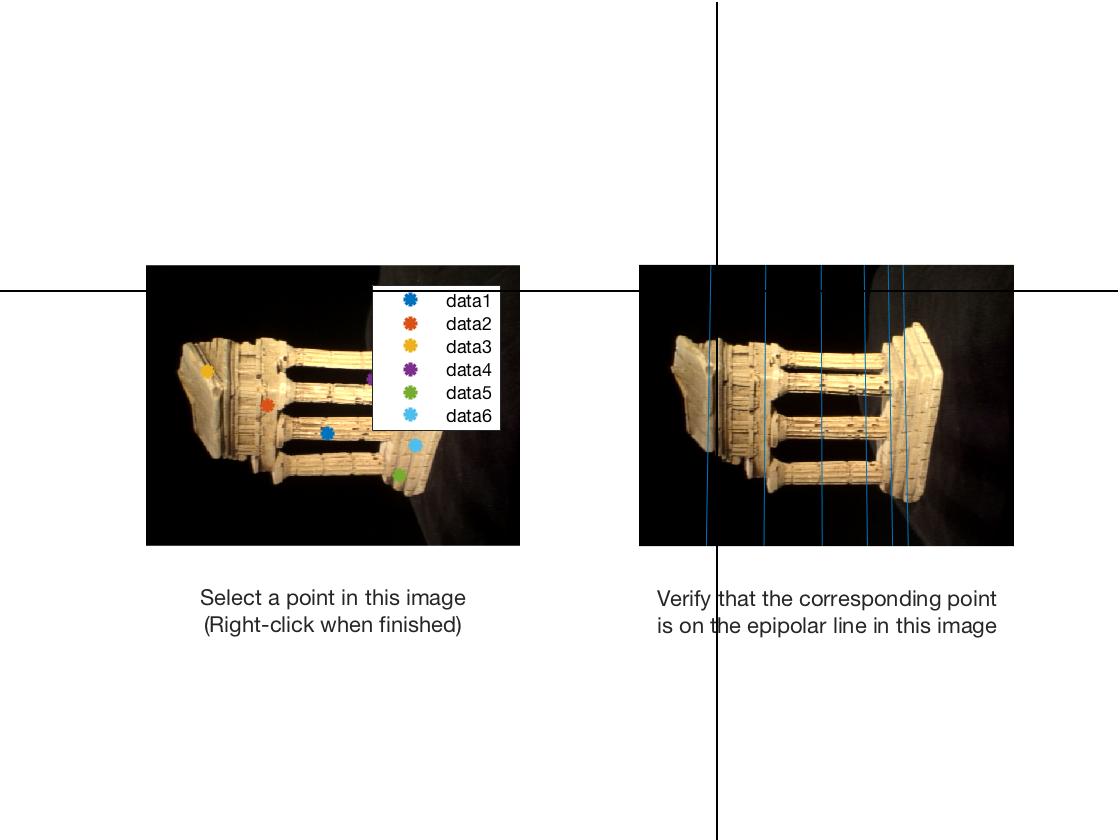
F =

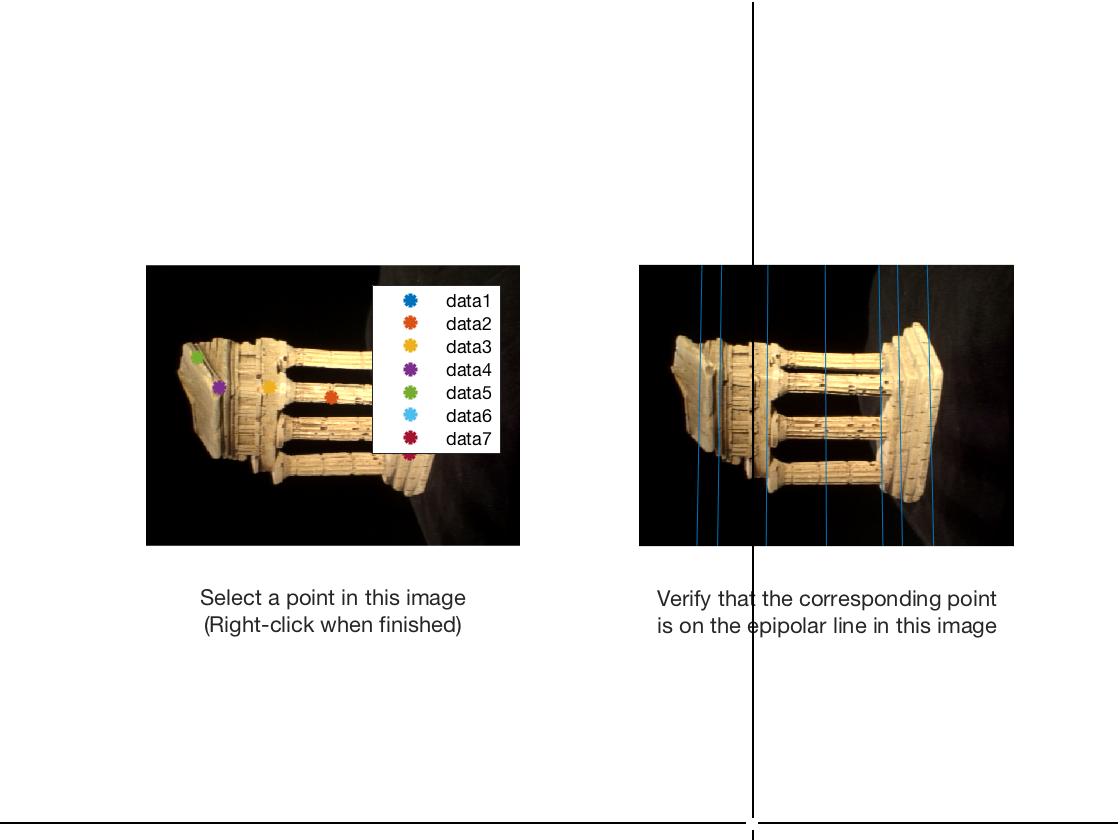
0.0000 -0.0000 0.0071

-0.0000 0.0000 0.0002

-0.0064 0.0002 -0.2181



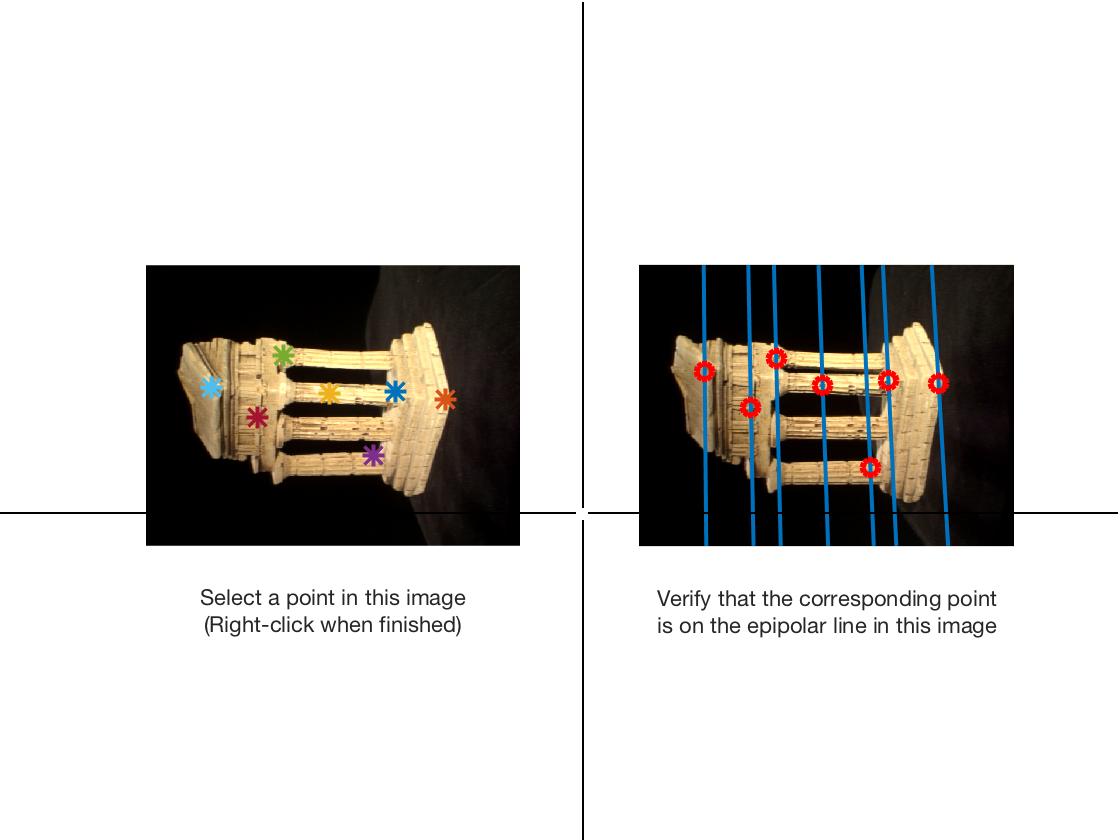




Q 3.2

Where is the coordinate of point from camera ; is the projective matrix of camera ; is the number of row vector in the projective matrix.

Q 4.1



Q 4.2

