1.

a. Code

b. Report M

```
PS C:\Users\Shawr\OneDrive\Desktop\EECS_Courses\EECS_442\hw5\hw5> python task1.py
[[ 0.45827554 -0.29474237 -0.01395746  0.0040258 ]
 [-0.05085589 -0.0545847  -0.54105993 -0.05237592]
 [ 0.10900958  0.17834548 -0.04426782  0.5968205 ]]
```

c. Code

d. Describe what relationship, if any, there is between Equation 2 as above and Equation 6 in the HW5 Notes

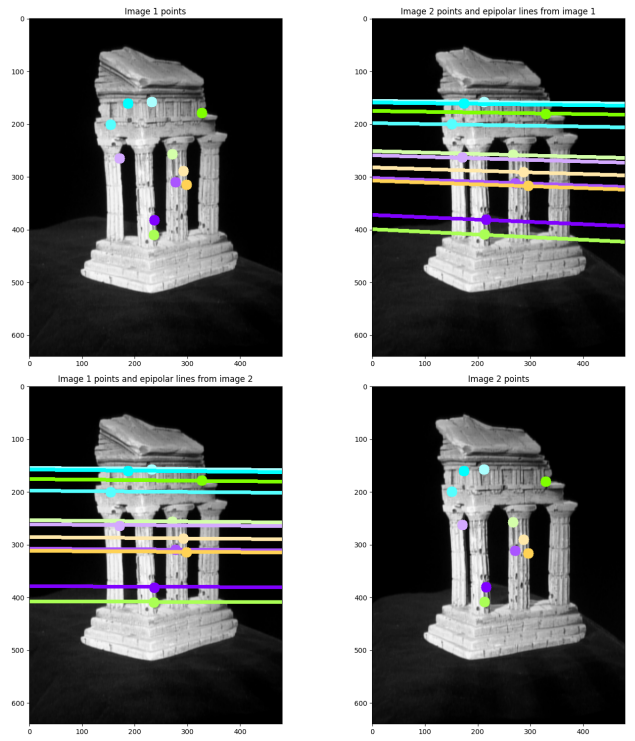
Both equations help us describe the projection between Xi and pi using a matrix M to transform Xi. However, equation 2 from above is defined by error (distance) between this estimated projection and the actual point. Cross product (related to eqn 6) does not necessarily measure the distance between the two points, but rather the area of the parallelogram, because larger vectors (even when in the same direction) result in a different outcome. The size of the parallelogram found from eqn 6 does not necessarily describe the distance between points, meaning eqn 2 is less susceptible to noise and therefore better to minimize.

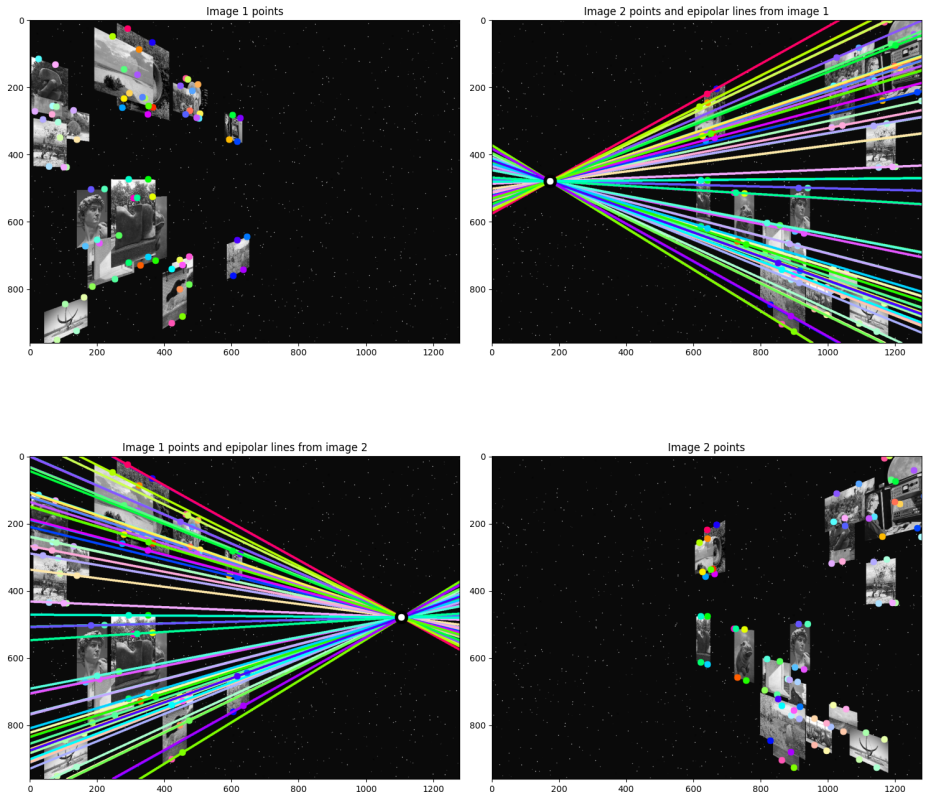
2.

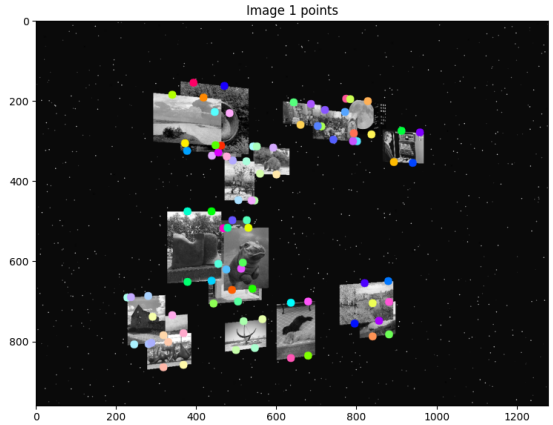
a. Code

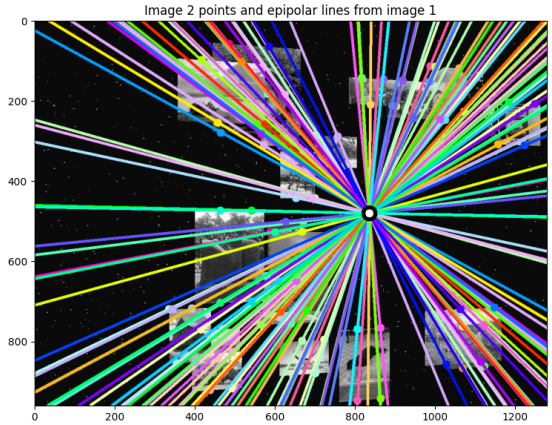
b. Code

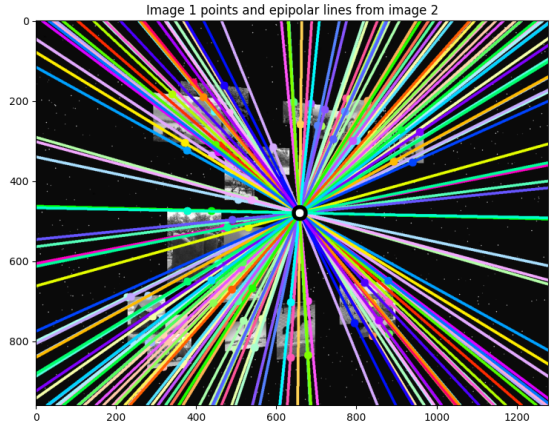
c. Show epipolar lines for temple, reallyInwards, and another dataset of your choice.

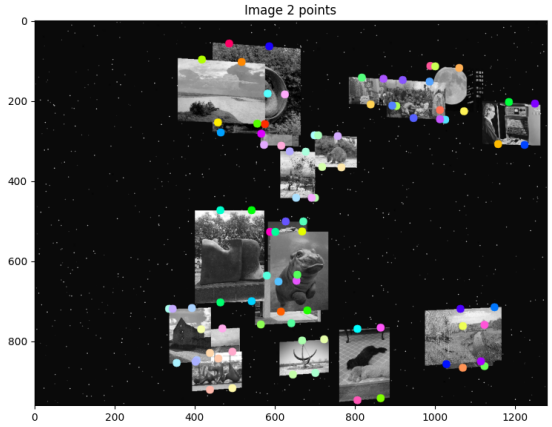












d. Report the epipoles for reallyInwards and xtrans.

```
reallyInwards
[9.17474417e-01 3.97793923e-01 8.29600415e-04] [-0.33981742 -0.94048938 -0.00196258]
[1105.92328605  479.50063157] [173.14814624 479.21024668]
```

```
xtrans
[-1.00000000e+00  1.17029563e-14  1.91961808e-17] [ 1.00000000e+00 -1.18180205e-14  0.00000000e+00]
C:\Users\Shawr\OneDrive\Desktop\EECS_Courses\EECS_442\hw5\hw5\task23.py:157: RuntimeWarning: divide by zero encountered in divide
  print(e1[:2]/e1[-1], e2[:2]/e2[-1])
[-5.20936956e+16  6.09650245e+02] [ inf -inf]
```

3.

a. Compute the Essential Matrix E for the Fundamental Matrix F (reallyInwards)

```
Essential Matrix:  [[-2.35201552e-04  1.63168728e+00  9.24399001e-04]
 [ 1.63173721e+00 -8.55649353e-04 -7.60264788e-01]
 [ 1.17886560e-03  7.61755555e-01 -1.68864256e-04]]
```

b. Code (todo)

c. Put a visualization of the point cloud for reallyInwards in your report.