GVG Lab-13 EN

1. (a) Find the unknowns a, b, c in the following fundamental matrix

$$\mathsf{F} = \begin{bmatrix} a & 1 & 1 \\ b & 1 & 0 \\ c & 2 & 1 \end{bmatrix}$$

when the epipole in the first image is $[1, 1]^\top$.

(b) Find the epipolar line in the second image that corresponds to point $[0, 1]^\top$ in the first image.

2. Consider two cameras with scaled camera projection matrices

$$\mathsf{Q}_1 = \xi_1 \mathsf{P}_1 = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \quad \mathsf{Q}_2 = \xi_2 \mathsf{P}_2 = \begin{bmatrix} 0 & 0 & -1 & -1 \\ 0 & 1 & 0 & -1 \\ -1 & 0 & 0 & 0 \end{bmatrix}$$

Find point $\vec{X}_\delta$ in space that projects into image points $\vec{u}_{1\alpha_1} = [2, 1]^T$, $\vec{u}_{2\alpha_2} = [2, 0]^T$.

3. Suppose we are given the essential matrix

$$\mathsf{E} = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

Compute 4 pairs $(\mathsf{R}, \vec{t}_\delta)$ with $\|\vec{t}_\delta\| = 1$ such that they define E (up to scale).