Exercise 2: Epipolar constraint

According to the stereo vision geometry, we can get the following relationship:

$$
\begin{aligned}
(R \cdot XO_R + O_RO_L) \times XO_L &= 0 \\
(R \cdot XO_R) \times XO_L + O_RO_L \times XO_L &= 0 \\
(R \cdot XO_R) \times XO_L + O_RO_L \times (R \cdot XO_R + O_RO_L) &= 0 \\
(R \cdot XO_R) \times XO_L + O_RO_L \times (R \cdot XO_R) &= 0 \\
XO_L^T \cdot (R \cdot XO_R) \times XO_L + XO_L^T \cdot (O_RO_L \times (R \cdot XO_R)) &= 0 \\
XO_L^T \cdot (O_RO_L \times (R \cdot XO_R)) &= 0 \\
XO_L^T \cdot [O_RO_L]_\times R \cdot XO_R &= 0 \\
XO_L^T \cdot E \cdot XO_R &= 0
\end{aligned}
$$

Thus the essential matrix is in form $E = [O_RO_L]_\times R$