**Exercise 5.4:**

The perspective projection to the plane with normal vector $(\frac{\sqrt{3}}{3}, \frac{\sqrt{3}}{3}, \frac{\sqrt{3}}{3})^\top$ through the point $(1, 2, 3)$ and the origin of the coordinate system as centre of the projection shall be reduced to a parallel projection onto the $x/y$-plane. Specify a suitable transformation as a composition of elementary geometric transformations and the transformation in equation (5.7).

**Solution (sketch):**
Shift the projection plane to the origin of the coordinate system and rotate it, so that the $x/y$-plane becomes the projection plane.

$$R_y(-\pi/4) \cdot R_z(\pi/4) \cdot T(-1, -2, -3)$$

The original centre of projection (the origin of the coordinate system) is mapped by this transformation to the point

$$\left( \frac{1 + 3\sqrt{2}}{2}, \frac{-3\sqrt{2}}{2}, \frac{1 - 3\sqrt{2}}{2} \right).$$

Therefore, it is necessary to apply the transformation

$$T\left( -\frac{1 + 3\sqrt{2}}{2}, \frac{3\sqrt{2}}{2}, 0 \right)$$

to map the centre of projection to the $z$-axis. Finally, the transformation from equation (5.7) where $z_0 = \frac{1-3\sqrt{2}}{2}$ must be applied.