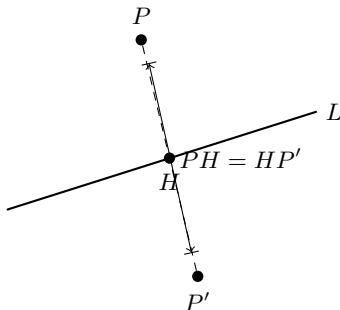


Question 7

Reflect the point $P = (4, 0, 1)$ across the line $L : \vec{r} = \langle 1, 1, 1 \rangle + t \langle 1, -1, 0 \rangle$. That is, find P' such that L perpendicularly bisects $\overline{PP'}$.

Question 7 – Solution

Strategy First find the perpendicular foot H on the line; then use $H = (P + P')/2$.



Projection point Write $H = (1 + t, 1 - t, 1)$. The condition $(P - H) \cdot \langle 1, -1, 0 \rangle = 0$ gives

$$\langle 3 - t, t - 1, 0 \rangle \cdot \langle 1, -1, 0 \rangle = 4 - 2t = 0,$$

so $t = 2$ and $H = (3, -1, 1)$.

Reflection Therefore $P' = 2H - P = \boxed{(2, -2, 1)}$.

Verification The midpoint of P and P' is H , and $P - H = \langle 1, 1, 0 \rangle$ is perpendicular to the direction of L .