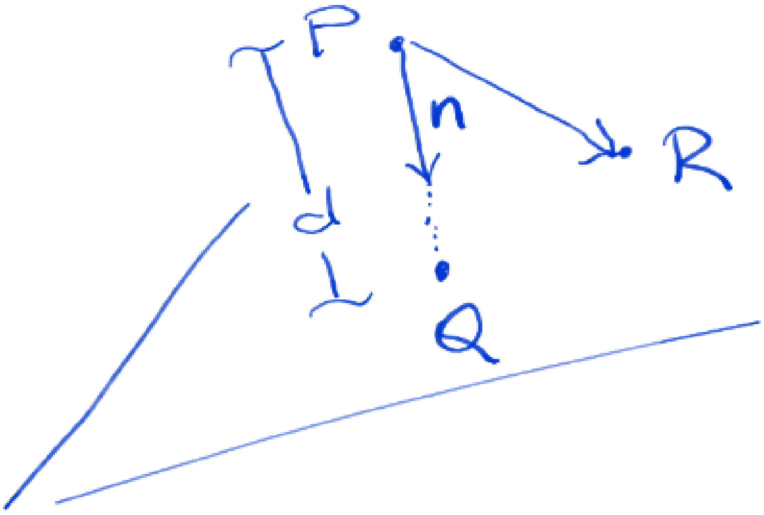
3 (a)



$$\text{Let } R := (10, 1, -1)$$

$$n := (1, -3, 1)$$

$$P := (4, -1, 5)$$

$$d = \frac{|\langle R - P, n \rangle|}{|n|}$$

$$= \frac{|\langle (6, 2, -6), n \rangle|}{\sqrt{11}}$$

$$= \frac{6}{\sqrt{11}}$$

(b) Since Q is in the plane,

$$Q = P + d \cdot \frac{1}{|n|} n$$

$$= P + \frac{6}{11} n$$

$$= \left({}^{38}/_{11} , {}^{7}/_{11} , {}^{49}/_{11} \right) \quad \boxed{\checkmark}$$

4 (a) First, using homogeneous coordinates, we have

$$\langle n, u \rangle = 0 \text{ and } \langle n, v \rangle = 0,$$

where $u := (3, 8, 1)$ and
$v := (5, -2, 1)$
are the homogeneous coordinates of P_0 and P_1, respectively.

Second, we have

$$n = u \times v$$
$$= (10, 2, -46).$$

Finally, n is the vector we are looking for.

(b) First, looking the cartesian equations of the two lines, we have that

$$\langle n_1, p' \rangle = 0$$

and

$$\langle n_2, P'' \rangle = 0,$$

where $n_1 := (3, -5, -8)$
$n_2 := (4, 2, -7)$,

are the homogeneous equations.

Second, let P_h be a point that satisfies these last two equations. Then it holds:

$$P_h = n_1 \times n_2$$
$$= (51, -11, 26).$$

Finally, transforming P_h into cartesian coordinates:

$$\left({}^{51}/{}_{26}, {}^{-11}/{}_{26} \right),$$

where this last vector is the intersection point of the original lines. $\boxed{\checkmark}$