

Math 203 — Lines

Problem 1. Write vector equations of the following lines.

- Line ℓ_1 passing through the points $P = (2, 1, 5)$, $Q = (7, -2, 4)$
- Line ℓ_2 passing through the points $P = (1, 2, 1)$, $Q = (11, -4, -1)$
- Line ℓ_3 passing through $P = (0, 1, 2)$ and orthogonal to both vectors $\mathbf{v} = \langle 1, 2, -1 \rangle$, $\mathbf{w} = \langle 2, 0, 1 \rangle$.

Problem 2. Are any of the lines in Problem 1 parallel? For each pair of lines, explain why or why not.

Problem 3. Determine whether the point $(2, 1, 5)$ lies on both ℓ_1 and ℓ_2 and make a conclusion about whether ℓ_1 and ℓ_2 are the same line.

Problem 4. The following two lines intersect:

$$\begin{aligned}\ell_1(t) &= \langle 5, 0, 3 \rangle + t \langle -1, 1, 1 \rangle \\ \ell_2(t) &= \langle 1, 4, 7 \rangle + t \langle 3, 0, -3 \rangle.\end{aligned}$$

Find their point of intersection.