Additional Exercises: Chapter 6
Linear Algebra and Probability for Computer Science Applications

For the following exercises you may use Matlab. You should show the computation involved, not just give the answer.

Exercise 1

Let P be the plane in $\mathbb{R}^3$ containing the three points $\langle 1, 0, 1\rangle$ $\langle 1, 2, 3\rangle$ and $\langle -1, 2, 1\rangle$ and let Q be the plane containing the three points $\langle 5, 2, 1\rangle$, $\langle 1, 0, 1\rangle$, and $\langle -3, -1, -1\rangle$. Find the line that is the intersection of P and Q and represent it in parameterized form $\{p + t \cdot \vec{v} \,|t \in \mathbb{R}\}$

Exercise 2

Find the distance between the line $\langle 1, 0, 2\rangle + t \cdot \langle 1, -1, 1\rangle$ and the line $\langle 3, -2, -1\rangle + u \cdot \langle -2, 1, 1\rangle$. Hint: If L and M are two skew lines in $\mathbb{R}^3$ (or higher dimension) — that is, two lines that are not parallel but do not intersect — and $\mathbf{p}$ and $\mathbf{q}$ are their two closest points, then the line containing $\mathbf{p}$ and $\mathbf{q}$ is perpendicular to both L and M.

Exercise 3

Let P be the same plane as in Exercise 1. Are the two points $\langle 12, 16, -2\rangle$ and $\langle -5, 18, -10\rangle$ on the same side of P or on opposite sides?